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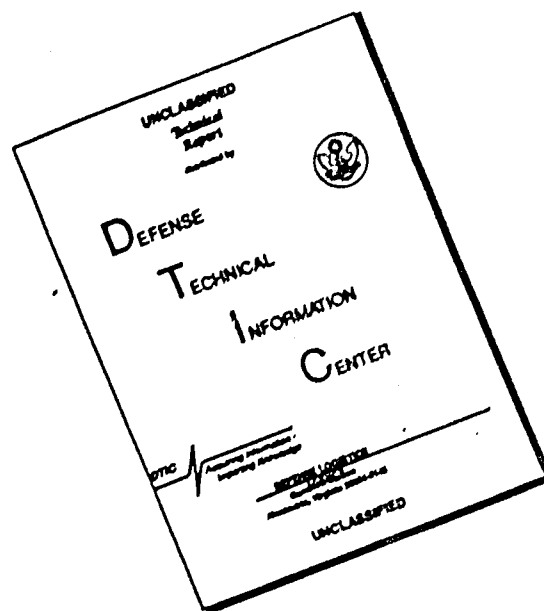


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Report 3562

The Template Method of Illumination Design

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NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER

Bethesda, Md. 20034



THE TEMPLATE METHOD OF ILLUMINATION DESIGN

By
G. W. Turner and J. P. Sinay

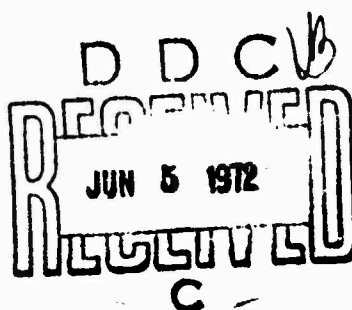
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Annapolis

RESEARCH AND DEVELOPMENT REPORT

May 1972



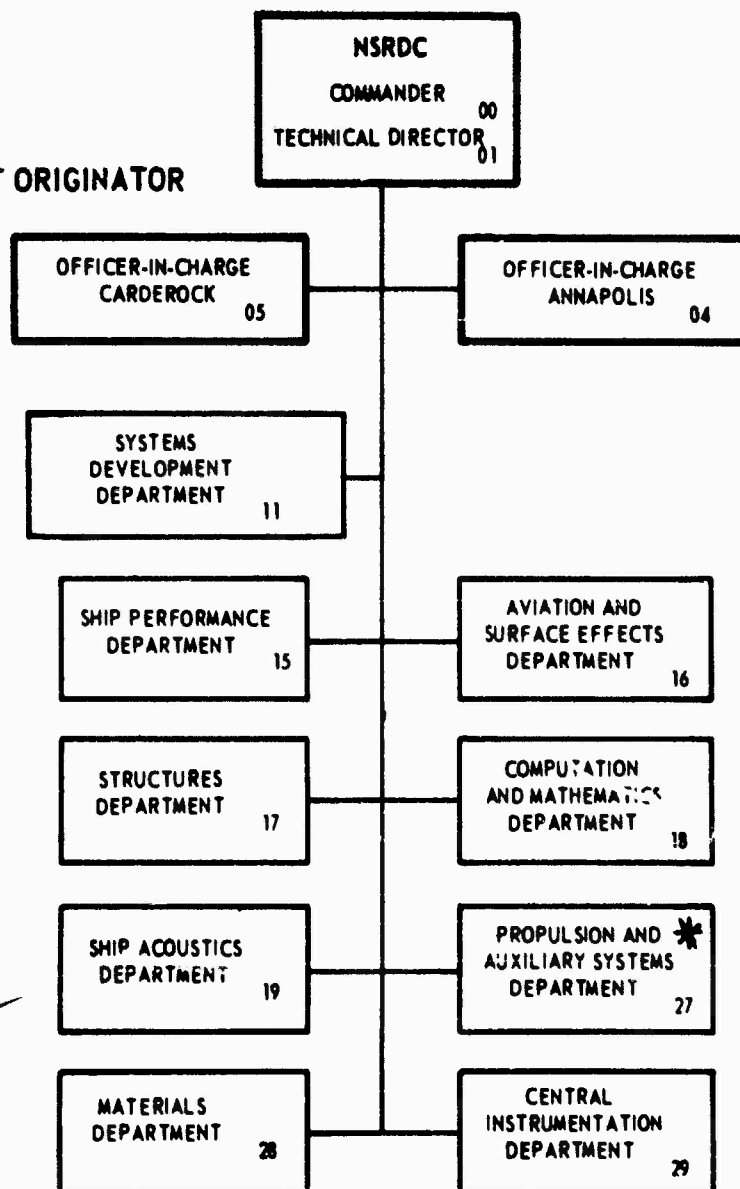
Report 3562

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Naval Ship Research and Development Center
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THE TEMPLATE METHOD OF ILLUMINATION DESIGN

By
G. W. Turner and J. P. Sinay

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ABSTRACT

This report describes a simple procedure for designing red lighting systems for use during night shipboard underway replenishment. Use of this method, which employs a federal stock lighting fixture, produces a lighting system layout plan that can be used to verify and check the adequacy of the lighting system. The method is sufficiently general that it can be utilized to design various lighting systems using other types of lighting fixtures.

ADMINISTRATIVE INFORMATION

This work was accomplished under Task Area S410-004, Task 11846, Work Unit 1-624-136.

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THE TEMPLATE METHOD OF ILLUMINATION DESIGN

By
G. W. Turner and J. P. Sinay

INTRODUCTION

BACKGROUND

Investigations of night lighting systems for underway replenishment (UNREP) operations have demonstrated a need for improved and efficient methods for designing shipboard illumination systems. Current methods of calculating shipboard illumination levels for UNREP operations vary from the "educated guess" to detailed laborious mathematical computations. The method proposed here is intended to supplant those methods; it employs specially prepared templates (scaled patterns of illumination levels), it is simple and efficient, and it is based on the mathematics of illumination engineering yet does not require the user to employ this mathematics.

Although this improved method, which will hereafter be designated as the template method, is applicable to the design of any lighting system, it is detailed here only for red lighting systems intended for use in UNREP operations. This method can also be used to evaluate existing lighting systems that employ the variables addressed in this method, i.e., light fixtures, filters, and lamps. For example, a ship's inspector, using the templates and ship's plans, can determine the light levels and light distribution patterns after he has confirmed the mounting heights and aiming angles of the installed light fixtures.

APPROACH

This report describes a method of designing a lighting system for any outdoor application where there is little or no reflection of light from the surroundings and where the minimum distance from the light source to the illuminated surface is at least five times the maximum dimension of the light source. In such a situation the light is assumed to be emitted from a point source, and the light source is referred to as a point source luminaire. The standard point source formula for computing the illumination, E, is:

$$E = \frac{I_{\theta} \cos^3 \theta}{H^2}$$

where

E = illumination in foot-candles

I_{θ} = candlepower of source in direction of the light ray (θ)

H = mounting height of the luminaire above the illuminated area

θ = angle of the light ray measured from the vertical.

The method described here makes it unnecessary for the shipyard lighting engineer to solve the above point source equation, thereby eliminating the possibility of mathematical errors.

WHAT IS THE "TEMPLATE METHOD" ?

In its broadest sense, the template method is a simplified technique of designing illumination systems. It is the application of a mathematical concept to achieve a simple, time-saving standardized technique for the lighting systems designer. It is based on point source calculations and provides only the essential information needed to describe an UNREP lighting system. It tells the designer what light level he will achieve by using lamp X in light fixture Y located at a perpendicular height Z above the deck, when the fixture is aimed at angle θ which is relative to the perpendicular to the deck.

The method employs "templates" which are scaled representations of the beam pattern that is incident on a horizontal plane. To meet the UNREP needs these patterns have been constrained by specific minimum and maximum illumination values which will be discussed later. For a given lamp, luminaire, mounting height, and aiming angle, a unique pattern is produced on the deck; ideally we would expect this and similar patterns to be elliptical in shape when the aiming angle is greater than 0° .

It is suggested that each of the templates be marked with its representative set of lighting variables (light fixture, lamp, mounting height, and aiming angle) and that the templates be grouped according to the type of lamp they represent. An example of a typical template for a 300-watt parabolic reflectorized tungsten (PAR)-type medium flood lamp, (MFL) when mounted at a height of 36 feet above the deck and aimed at 35° from the vertical appears as figure 1. Data used to construct this and other templates appear in appendix A.

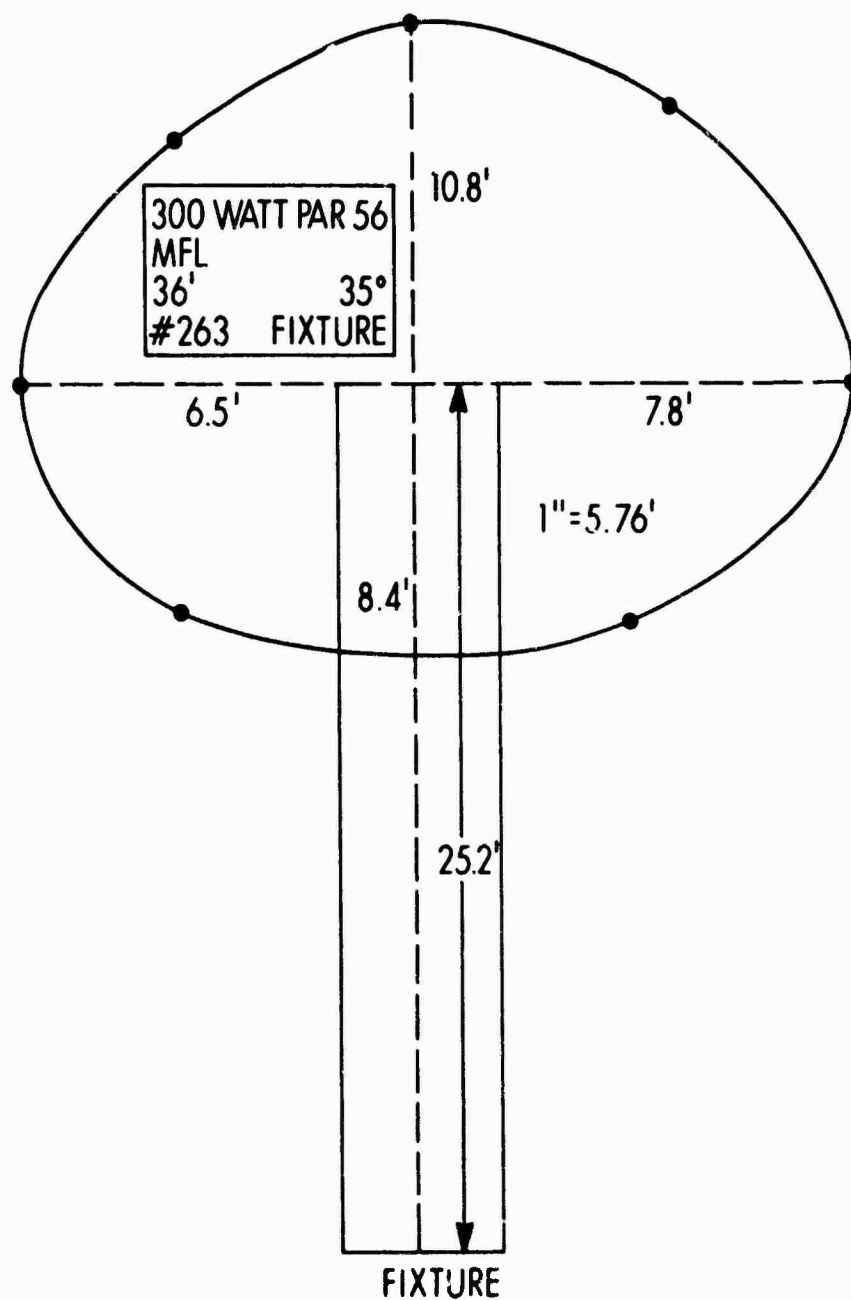


Figure 1
 Template for a 300-Watt Medium Flood PAR 56 Lamp
 Mounted at a Height of 36 Feet and Aimed at 35°

The "handle" of the template is the horizontal distance, measured on the deck, from the center (+) of the illumination pattern to the lamp fixture. It tells where the template should be positioned on a ship's plan drawing, relative to the light fixture. The illumination at the center spot is close to the maximum level within the pattern. The actual maximum illumination level occurs slightly closer to the mounting position along the radial line from the center spot to the "mounting pole."

The template method has two aspects. First, the generation of template parameter values, and second, the use of these illumination patterns (templates) to lay out an effective or optimal disposition of fixtures and lamps. This optimization involves several key variables;

- Intensity of light.
- Effective distribution of light.
- Dark adaption.
- Lighting fixtures (luminaires).

The last variable in the list implicitly provides cost-effectiveness analysis, as it allows the designer to perform cost tradeoffs of lights (lamps and fixtures) versus power consumption.

ASSUMPTIONS AND LIMITATIONS

The calculations embodied within the template method are based on point source illumination mathematics. That is, all of the light is considered to be emitted from a single point. In order for this assumption to be valid, the distance from the light source to the lighted surface must be at least five times the maximum dimension of the light source, according to the Illumination Engineering Society Handbook. Thus, for the 263 fixture, for example, the method would not hold true for mounting heights of less than 2.5 feet.

There are several other assumptions and limitations imposed upon the template method for UNREP lighting of supply ships. The technique is designed for large, open spaces; thus, we can assume there is negligible reflectivity.

We assume that no aiming angle will be greater than 45° , since any greater angle will result in an unwanted glare situation.

We have restricted the center spot illumination to an acceptable range of 0.9 to 2.5 foot-candles. The mounting height and aiming angle combinations selected must therefore result in an illumination pattern which conforms to these specifications. We further require that an illumination of 0.2 ft-c* of red light exists at the edge of the pattern. This is the minimum allowable illumination for noncritical areas and for critical areas the illumination patterns should be slightly overlapping to ensure a minimum of 0.4 ft-c of red light. In the fringe areas where very little activity normally occurs or in areas where only the minimum illumination is required, the 0.2 ft-c of red light is quite adequate.

We assume that the tasks are performed 3 feet off the deck; thus, the illumination pattern should be raised 3 feet. We have not built this assumption into the data in the appendixes, however, and provision for it must be made by adding 3 feet to the mounting height and adding a distance of $3 \tan \theta$ radially to the center spot distance to obtain the new aiming point. The aiming point is computed for the purpose of positioning or "aiming" the fixture. If the light pattern is to be on the deck, the aiming point will coincide with the center spot. Similarly, if task performance is required at some other height, X feet above the deck, then the mounting height should be increased X feet and the aiming point increased $X \tan \theta$ radially.

The calculations required to produce the illumination pattern data were performed on an IBM 360-40 computer at NAVSHIPRANDCEN Annapolis. The computer program listing is given in appendix B, and a discussion of the program and how to use it is given in appendix C, a user's guide. The program uses candlepower distributions as measured by NAVSHIPRANDCEN Annapolis and it can also use similar data as provided by the lamp manufacturer for each lamp under study. It is assumed that the sample lamps measured are representative of their class. It should be noted, however, that an extreme-valued sample providing inputs is a possible source of error.

Facilities were not available locally for the experimental verification of the tables included in appendix A; however, all of the calculations are theoretically sound.

*Abbreviations used in this text are from the GPO Style Manual, 1967, unless otherwise noted.

WHAT DOES THE TEMPLATE METHOD MEAN TO THE SHIPYARD LIGHTING ENGINEER ?

It means no calculations, no measurements, and no guessing. He will have at his disposal sets of scaled templates with which he can devise a lighting scheme consistent with his needs.

HOW TO USE THE TEMPLATES

To begin with, procure a scaled plan-view drawing of the ship area to be illuminated.

Make certain that the scales of the ship's deck plan and the template set are consistent.

Divide the total area to be illuminated into relatively equal area sections around the kingposts or other positions that provide high possible mounting heights. Using a colored pencil, lay out the critical work areas (areas used by the transfer station crew for their various tasks that must be adequately illuminated) on the ship's deck plan - this will ensure that these areas will receive priority lighting attention. Mark the possible fixture mounting locations. Now choose an illumination pattern (template) which will cover the area farthest from the fixture mounting position (generally using a narrow spot (NSP) lamp with a high mounting height and a large aiming angle). Place the illumination template relative to the fixture mounting position and lightly trace the ellipse pattern onto the deck plan. Transfer the lamp type (NSP, MFL, wide flood (WFL), etc) and wattage, the fixture type, the mounting height and aiming angle, and the distance to the center spot all onto the lighting plan layout on the inside of the pattern just traced. Since this illumination is generally measured approximately 3 feet above the deck (where most task visibility is required), each of the given mounting heights should be increased by 3 feet. This in effect raises the pattern 3 feet above the deck.

The new lamp aiming point (\odot AP) for this raised illumination pattern will be at a distance of 3 tangent θ feet away from the old center point on a radial line from the fixture mounting position. Mark the new mounting height (MH) and aiming point on the diagram.

In a similar manner continue to cover the remaining areas, making certain that the illumination patterns are tangent to one another or overlapping slightly, as in figure 2. This will ensure that the specified areas are adequately illuminated by the initial lighting system design plan.

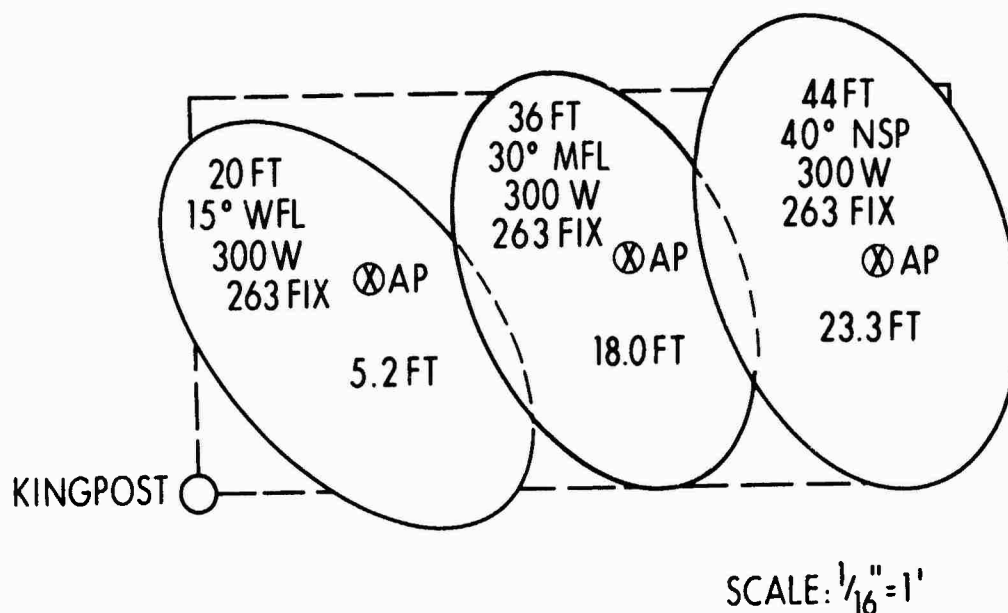


Figure 2
Lighting System Design Plan Showing Overlap
of Illumination Patterns

Once this initial plan has been laid out, it is necessary to visit the ship and check to see that the proposed mounting positions are clear of all rigging or other obstructions which might block the distribution of the light.

If there are obstructions, this initial design is not sufficient and another more suitable configuration must be found. In all likelihood a satisfactory arrangement may be found simply by replacing the blocked beam pattern by one which will result in approximately the same coverage from another mounting height or position. Note whatever changes are made on the lighting design plan. Once the area is suitably covered, the lamps can be physically positioned in place and properly aimed. A visual illumination check for shadows in critical areas should then be performed at night to confirm the adequacy of the lighting scheme. If shadows exist in any of the critical areas, than another repositioning of fixtures will be required, followed by appropriate changes in the lighting system layout plan. After the lighting system has been finally checked out for adequate lighting of critical areas and the absence of shadows, the lighting layout plan becomes the final document for verification that the red lighting system has been adequately designed and installed.

Further detailed lighting surveys could be performed to verify this red lighting system but the necessity for calibrating a low level light meter for this special red light and making the light measurements at sea (in the absence of any white light) make further testing of the lighting system extremely complex and difficult.

To expedite matters in applying the template method, it would be highly advantageous to have some standard-scale clear plastic templates all ready at hand for each lamp available. These templates would then be completely reusable and would guarantee uniformity from one installation to another.

These sets would be off-the-shelf items, available to every lighting engineer, much as a set of French curves are available to every draftsman. Unfortunately, the scale used on ship's plans varies greatly with the size and type of ship. And lighting requirements vary as well. For some application other than UNREP operations, 0.2 ft-c may not do as the minimum illumination level; 0.5 ft-c may be required, or 1.0 or 5.0 ft-c.

It becomes obvious that the number of plastic templates required to suit every scale, every lamp, every fixture, and every light level would be prohibitively large.

If you are provided with a set of templates of the same scale as your deck plans, it is a simple matter to use them.

But what if you are not provided with a set of templates? The tables in appendix A contain all the data necessary to create your own templates, appropriately scaled, as the need arises. You may choose to prepare each template as you need it, or to prepare an entire set which can be retained and reused. Paper will suffice for templates which will be used on a short-term basis only.

HOW TO PREPARE A TEMPLATE

The illumination pattern templates are basically ellipses. The tables in appendix A contain all the data necessary to make up a template. For construction of the template, reference all dimensions from the center spot (+) as the origin of a set of orthogonal axes, as in figure 3. The axis determined by the fixture position and the center spot is the radial or vertical axis. Perpendicular to the radial axis is the transverse or horizontal axis. Determine the desired scale and lightly mark the the two axes, darkening their intersection with a "+" for the

center spot. Locate the fixture position along the vertical axis according to the distance to the center spot. Now locate the minimum illumination points, E, F, K, and L, along the transverse and radial axes, respectively, as in figure 4. If you are working with the four-axis method, locate the additional minimum illumination points, M, N, R, and S, along the oblique axes as shown in figure 5.

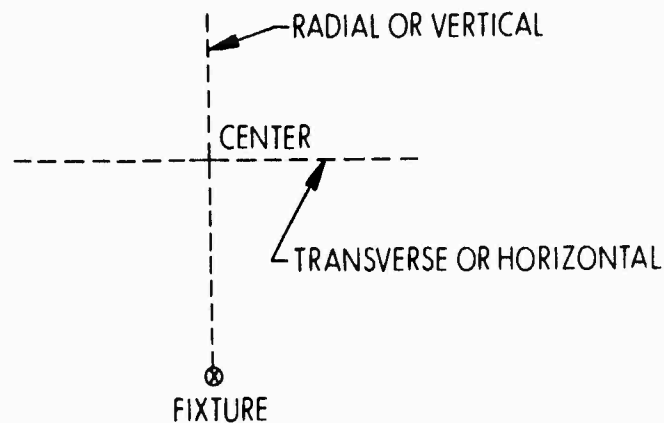


Figure 3
Horizontal and Vertical
Axes for Construction of
Template

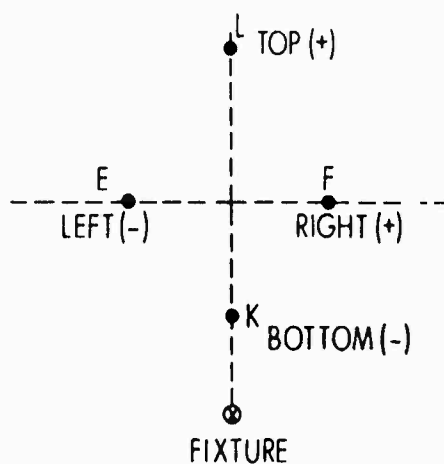


Figure 4
Horizontal and Vertical Axes
with Minimum Illumination Points

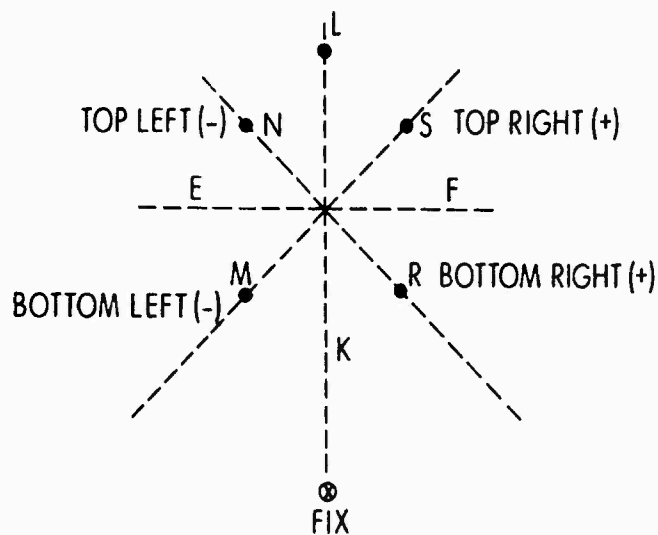


Figure 5
Horizontal, Vertical, and Oblique
Axes with Minimum Illumination
Points

Sketch an ellipse through points E, F, K, L (M, N, R, and S). Now cut out the ellipse, leaving a 1/2-inch strip on either side of the line to the fixture position. Print the word "FIX" on the end of this "handle" created by the 1-inch strip. To complete the template print the type of lamp (NSP, WFL, etc), the lamp wattage, the fixture, the mounting height in feet, and the vertical aiming angle on the ellipse in the upper left quadrant as shown in figure 6, and mark the scale used in preparing the template in the lower right quadrant.

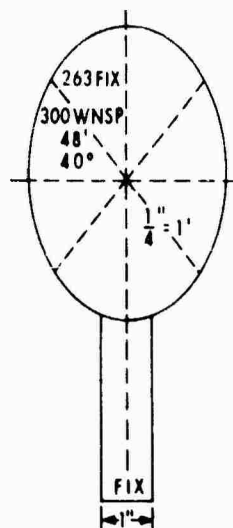


Figure 6
Completed Template Showing Lamp Type
and Wattage, Fixture, Mounting Height,
Aiming Angle, and Template Scale

The template is now ready to use. If a permanent set of clear plastic templates is made, they can be joined one atop the other by a pivot through the fixture as in figure 7, permitting the designer to select lamps by simply rotating the patterns about the pivot and overlaying the ship's plan. In this way, he can tell at a glance which lamp, height, and angle will best suit the space to be lighted.

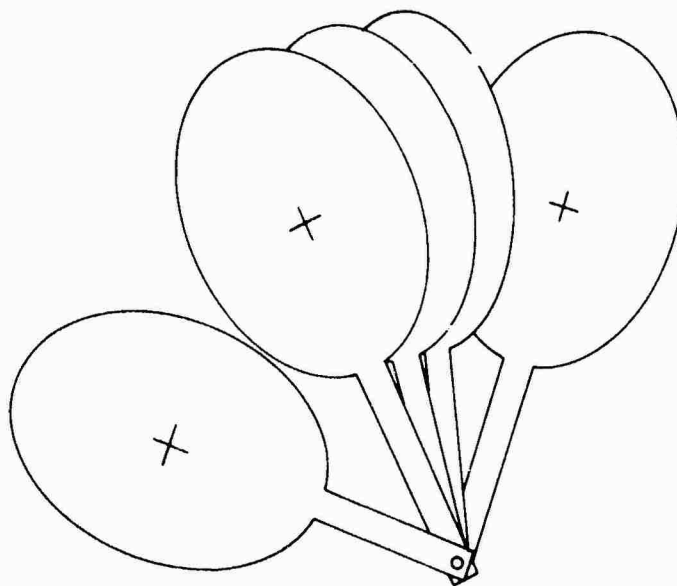


Figure 7
Pivotal "Layering" of Templates

The minimum illumination points can be most easily found in the quickscan format under the desired minimum illumination value. Figure 8 shows a portion of the quickscan format for the 300-watt PAR 56 wide flood lamp in the 263 fixture with Kopp 6350 filter. The "snowflake" diagram at the top center shows the sign conventions and axis labels set in accord with the view from behind the lamp and along the center line of the beam. The first three columns contain the mounting height H , the distance D from the "mounting pole" to the center spot, and the aiming angle θ , respectively.

Under each axis heading are a group of signs - - + + , and numbers 0.2 0.5 0.5 0.2 and the heading "DIR DIST to ILLUM LEVEL of." Under each of those headings can be found the distance from the center spot along the axis to the point where the illumination is approximately equal to the figure in the heading. For instance, when the lamp is mounted at 24 feet above the deck and aimed so as to make a 30° angle with the vertical, the illumination along the radial axis (bottom to top) is closest to 0.2 ft-c at 8.5 feet from the center spot towards the mounting position, and at 8.1 feet from the center spot away from the mounting position. Similarly if we wish to know where the illumination is nearest 0.5 ft-c, we see it is at ± 6.3 feet. The illumination along the other three axes can be read in a like manner. The quickscan format contains all the data needed to make a template and allows the designer to rapidly survey the available choices for a given source or between sources. If he would like to know how the light level "behaves," so to speak, inside the ellipse, the "abridged profile" lists directed distance and red illumination along each axis from the center spot to the first reading past the minimum acceptable illumination value. This may be of interest for purposes of overlapping template patterns and determining the light level within the overlap. Figure 9 shows a sample "abridged profile." Figure 10 shows a sample "complete illumination profile", which contains the input candlepower distribution, the white light level, the red light level, and the directed distances along each axis. The designer may consult the complete profile if he wishes to observe the light characteristics beyond the template boundaries. Complete illumination profiles can be made available from NAVSHIPRANDCEN Annapolis.

The quickscan format and the abridged profile are included for light sources in appendix A. The complete profile has been omitted since we are not concerned with those areas which do not satisfy the selection criteria. Figure 11 shows the additional summary format that is given for sources for which there are only two-axis inputs available, horizontal and vertical. It includes a "radial diameter" and a "transverse diameter," which are the rounded sums of the semiaxis lengths. It also explicitly calls out the illumination at the four edges.

THEORETICAL BASIS FOR THE CALCULATIONS

Figure 12 is a diagram showing a representative mounting position of the luminaire with its associated deck illumination pattern. Figure 13 is another diagram representing the same situation as figure 12, but giving some of the essential geometrical facts required for the derivation of data used in constructing templates.

300 WATT NARROW SPOT SYMBOL #263

HEIGHT = 44 FEET
 THETA = 45 DEGREES
 DISTANCE FROM BASE OF PILE TO CENTER SPOT = 44.00
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-15.97	0.04
-13.19	0.11
-10.24	0.47
-7.08	1.11
-3.68	1.95
0.0	2.05
4.02	0.90
8.44	0.28
13.34	0.07

RADIAL "DIAMETER" = 8.44 + 13.19 = 21.63

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.12	0.06
11.50	0.15
8.79	0.39
5.98	0.92
3.06	1.97
0.0	2.33
-3.22	1.17
-6.62	0.52
-10.24	0.16
-14.11	0.05

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.67	0.04
13.80	0.17
10.97	0.52
8.19	0.87
5.44	1.27
2.72	2.03
0.0	1.81
-2.72	1.35
-5.44	1.10

Figure 9 - Sample of Abridged Profile

300 WATT NARROW SPOT SYMBOL #263 MOUNTING HEIGHT = 44 FEET MOUNTING ANGLE, THETA = 45 DEGREES

-8.19 0.45

-10.97 0.12

-13.80 0.03

TRANSVERSE "DIAMETER" = 13.80 + 10.97 = 24.77

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-11.50 0.05

-8.79 0.19

-5.98 0.58

-3.06 1.14

0.0 1.72

3.22 1.82

6.62 0.84

10.24 0.37

14.11 0.11

19.27 0.02

Figure 9 (Cont)

300 WATT NARROW SPOT SYMBOL #263

HEIGHT = 44 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 44.00

THETA = 45 DEGREES

PER CENT RED = 0.150

PHI	CANDLE POWER -3 X 10	FOOT CANDLES WHITE	FOOT CANDLES RED	DISTANCE FROM CENTER
VERTICAL				
42.5	0.07	0.00	0.00	963.71
40.0	0.12	0.00	0.00	458.91
37.5	0.44	0.00	0.00	290.21
35.0	0.43	0.00	0.00	205.53
32.5	0.43	0.00	0.00	154.47
30.0	0.44	0.00	0.00	120.21
27.5	0.46	0.01	0.00	95.55
25.0	0.46	0.01	0.00	76.89
22.5	0.47	0.01	0.00	62.23
20.0	0.47	0.02	0.00	50.36
17.5	0.51	0.03	0.00	40.52
15.0	0.59	0.04	0.01	32.21
12.5	0.69	0.06	0.01	25.67
10.0	1.16	0.11	0.02	18.84
7.5	3.78	0.44	0.07	13.34
5.0	13.44	1.84	0.28	8.44
2.5	37.50	5.97	0.90	4.02
0.0	74.88	13.67	2.05	0.0
-2.5	62.75	12.99	1.95	-3.68
-5.0	32.00	7.43	1.11	-7.08
-7.5	12.19	3.14	0.47	-10.24
-10.0	2.64	0.75	0.11	-13.19
-12.5	0.84	0.26	0.04	-15.97
-15.0	0.50	0.17	0.03	-18.60
-17.5	0.14	0.05	0.01	-21.10
-20.0	0.06	0.02	0.00	-23.48
-22.5	0.04	0.02	0.00	-25.77
-25.0	0.02	0.01	0.00	-27.99
-27.5	0.01	0.01	0.00	-30.13
-30.0	0.01	0.01	0.00	-32.21
-32.5	0.01	0.00	0.00	-34.25
-35.0	0.0	0.0	0.0	-36.24
-37.5	0.0	0.0	0.0	-38.21
-40.0	0.0	0.0	0.0	-40.15
-42.5	0.0	0.0	0.0	-42.08
HORIZONTAL				
42.5	0.04	0.00	0.00	57.02
40.0	0.04	0.00	0.00	52.21
37.5	0.04	0.00	0.00	47.75
35.0	0.05	0.01	0.00	43.57

Figure 10 - Sample of Complete Illumination Profile

32.5	0.06	0.01	0.00	39.64
30.0	0.06	0.01	0.00	35.93
27.5	0.07	0.01	0.00	32.39
25.0	0.11	0.01	0.00	29.02
22.5	0.21	0.03	0.00	25.77
20.0	0.46	0.07	0.01	22.65
17.5	0.68	0.11	0.02	19.62
15.0	1.72	0.28	0.04	16.67
12.5	6.63	1.13	0.17	13.80
10.0	19.88	3.47	0.52	10.97
7.5	32.50	5.78	0.87	8.19
5.0	46.75	8.44	1.27	5.44
2.5	74.39	13.54	2.03	2.72
0.0	66.25	12.10	1.81	0.0
-2.5	49.25	8.97	1.35	-2.72
-5.0	40.50	7.31	1.10	-5.44
-7.5	16.88	3.00	0.45	-8.19
-10.0	4.50	0.78	0.12	-10.97
-12.5	1.31	0.22	0.03	-13.80
-15.0	0.63	0.10	0.02	-16.67
-17.5	0.49	0.08	0.01	-19.62
-20.0	0.35	0.05	0.01	-22.65
-22.5	0.10	0.01	0.00	-25.77
-25.0	0.08	0.01	0.00	-29.02
-27.5	0.06	0.01	0.00	-32.39
-30.0	0.06	0.01	0.00	-35.93
-32.5	0.05	0.01	0.00	-39.64
-35.0	0.05	0.01	0.00	-43.57
-37.5	0.04	0.00	0.00	-47.75
-40.0	0.04	0.00	0.00	-52.21
-42.5	0.04	0.00	0.00	-57.02

TOP RIGHT TO
BOTTOM LEFT

42.5	0.01	0.00	0.00	139.80
40.0	0.01	0.00	0.00	116.95
37.5	0.02	0.00	0.00	98.99
35.0	0.02	0.00	0.00	84.45
32.5	0.03	0.00	0.00	72.41
30.0	0.03	0.00	0.00	62.23
27.5	0.03	0.00	0.00	53.48
25.0	0.04	0.00	0.00	45.85
22.5	0.06	0.00	0.00	39.12
20.0	0.11	0.01	0.00	33.11
17.5	0.35	0.03	0.00	27.70
15.0	0.63	0.06	0.01	22.78
12.5	1.38	0.15	0.02	18.27
10.0	5.84	0.74	0.11	14.11
7.5	17.50	2.46	0.37	10.24
5.0	36.38	5.62	0.84	6.62
2.5	71.88	12.12	1.82	3.22
0.0	62.63	11.44	1.72	0.0
-2.5	38.88	7.63	1.14	-3.06
-5.0	18.38	3.85	0.58	-5.98
-7.5	5.66	1.25	0.19	-8.79
-10.0	1.50	0.35	0.05	-11.50
-12.5	0.78	0.19	0.03	-14.12
-15.0	0.59	0.15	0.02	-16.67
-17.5	0.51	0.13	0.02	-19.17
-20.0	0.46	0.12	0.02	-21.61
-22.5	0.42	0.12	0.02	-24.02
-25.0	0.41	0.11	0.02	-26.40
-27.5	0.38	0.11	0.02	-28.76

Figure 10 (Cont)

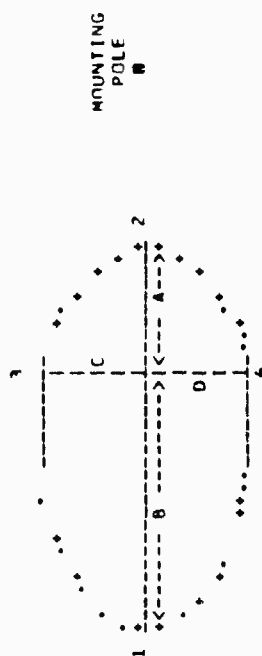
-30.0	0.30	0.08	0.01	-31.11
-32.5	0.09	0.03	0.00	-33.47
-35.0	0.07	0.02	0.00	-35.83
-37.5	0.07	0.02	0.00	-38.21
-40.0	0.06	0.02	0.00	-40.61
-42.5	0.06	0.02	0.00	-43.06

BOTTOM RIGHT
TO TOP LEFT

42.5	0.06	0.02	0.00	43.06
40.0	0.06	0.02	0.00	40.61
37.5	0.07	0.02	0.00	38.21
35.0	0.08	0.02	0.00	35.83
32.5	0.13	0.04	0.01	33.47
30.0	0.35	0.10	0.01	31.11
27.5	0.42	0.12	0.02	28.76
25.0	0.44	0.12	0.02	26.40
22.5	0.46	0.13	0.02	24.02
20.0	0.51	0.14	0.02	21.61
17.5	0.59	0.16	0.02	19.17
15.0	0.80	0.20	0.03	16.67
12.5	1.66	0.40	0.06	14.12
10.0	4.42	1.03	0.15	11.50
7.5	11.63	2.58	0.39	8.79
5.0	29.25	6.12	0.92	5.98
2.5	66.88	13.12	1.97	3.06
0.0	85.00	15.52	2.33	0.0
-2.5	46.13	7.78	1.17	-3.22
-5.0	22.50	3.48	0.52	-6.62
-7.5	7.50	1.05	0.16	-10.24
-10.0	2.50	0.32	0.05	-14.11
-12.5	0.78	0.09	0.01	-18.27
-15.0	0.41	0.04	0.01	-22.78
-17.5	0.11	0.01	0.00	-27.70
-20.0	0.06	0.00	0.00	-33.11
-22.5	0.04	0.00	0.00	-39.12
-25.0	0.04	0.00	0.00	-45.85
-27.5	0.03	0.00	0.00	-53.48
-30.0	0.03	0.00	0.00	-62.23
-32.5	0.03	0.00	0.00	-72.41
-35.0	0.03	0.00	0.00	-84.45
-37.5	0.03	0.00	0.00	-98.99
-40.0	0.02	0.00	0.00	*****
-42.5	0.01	0.00	0.00	*****

Figure 10 (Cont)

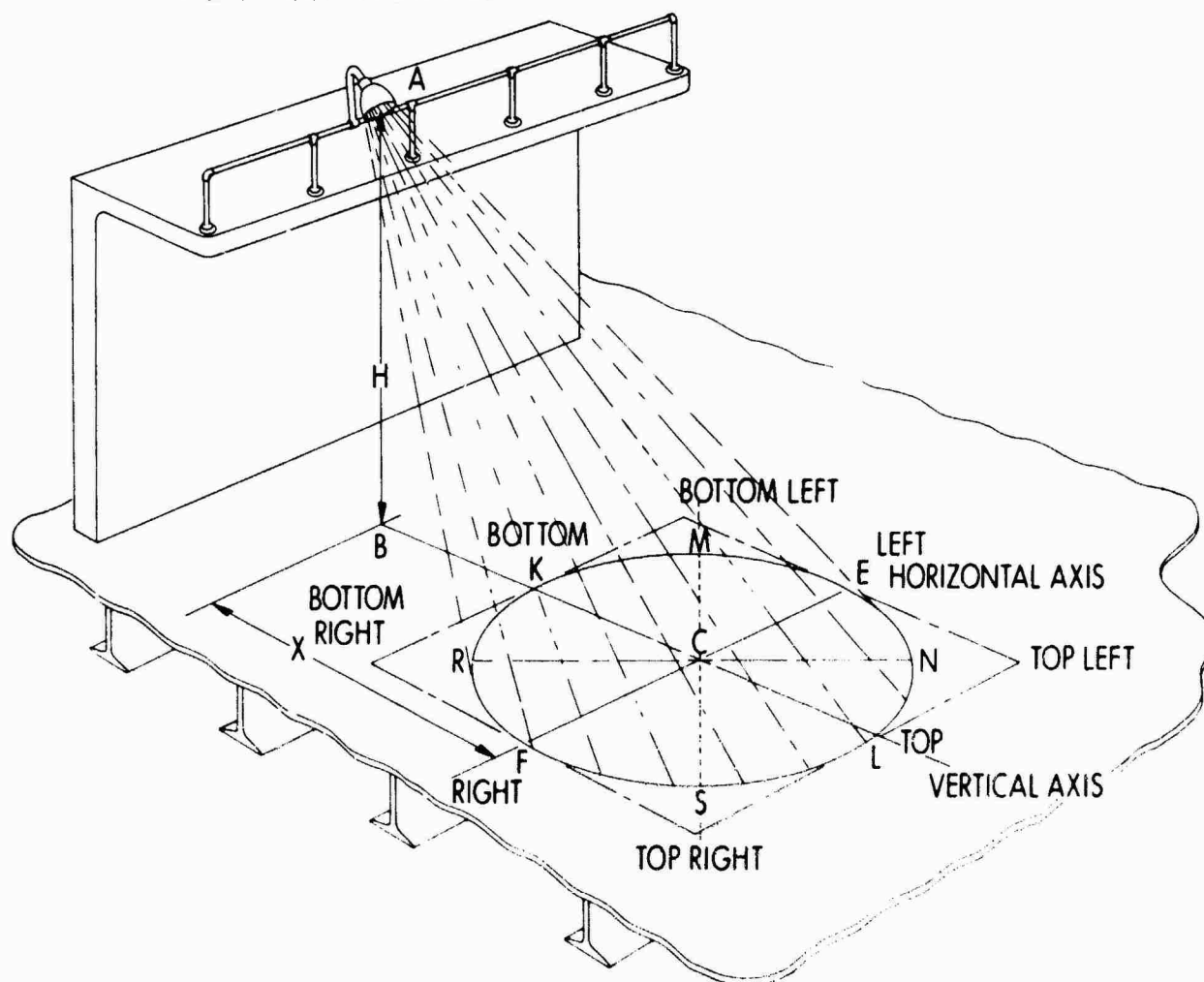
HORIZONTAL AND VERTICAL AXES INPUT ONLY



0 WATT PAR56 WFL BARE LAMP				RED TRANSMISSION FACTOR (1% RED) = 0.150									
VERTICAL AIMING ANGLE DEGREES Ø	RADIAL DISTANCE TO CENTER FT	R-RADIAL (VERTICAL) DIAMETER FT	T-TRANSVERSE (HORIZONTAL) DIAMETER FT	AREA (SQ FT)	CENTER ILLUMINA- TION, RED FC	EDGE ILLUMINA- TION, RED FC				SEMI-AXES LENGTH			
						1	2	3	4	B	A	C	D
HEIGHT 16 FT.													
45	16.0	17	26	347	2.13	0.20	0.20	0.15	0.15	9.1	7.7	13.1	13.1
HEIGHT 20 FT.													
35	14.0	16	28	351	2.12	0.25	0.16	0.15	0.15	7.8	7.7	14.1	14.1
40	16.8	18	27	381	1.74	0.19	0.15	0.25	0.25	9.3	8.5	13.6	12.6
45	20.0	20	29	355	1.37	0.13	0.24	0.19	0.19	11.4	8.5	14.7	14.7
HEIGHT 24 FT.													
15	6.4	14	29	318	2.42	0.17	0.26	0.17	0.17	7.4	6.4	14.3	14.3
20	8.7	15	29	341	2.23	0.14	0.26	0.15	0.15	8.1	6.6	14.7	14.7
25	11.2	16	31	389	2.00	0.12	0.25	0.14	0.14	8.9	7.0	15.3	15.3
30	13.9	16	29	364	1.74	0.23	0.23	0.25	0.25	8.1	7.4	14.4	14.4
35	16.8	17	31	413	1.47	0.18	0.22	0.21	0.21	9.4	8.1	15.3	15.3
40	20.1	20	33	518	1.21	0.13	0.19	0.17	0.17	11.1	8.9	16.3	16.3
HEIGHT 28 FT.													

Figure 11 - Summary Format Given for Sources Having Only Horizontal and Vertical Inputs Available

C-CENTER SPOT
 H-MOUNTING HEIGHT
 X-DISTANCE FROM "MOUNTING POLE" TO CENTER SPOT
 < CAB-MOUNTING ANGLE



NOTE: MINIMUM ACCEPTABLE ILLUMINATION LEVEL EXISTS AT
 POINTS K, M, E, N, L, S, F, AND R

Figure 12
 Representative Mounting Position of the Luminaire with its
 Associated Deck Illumination Pattern

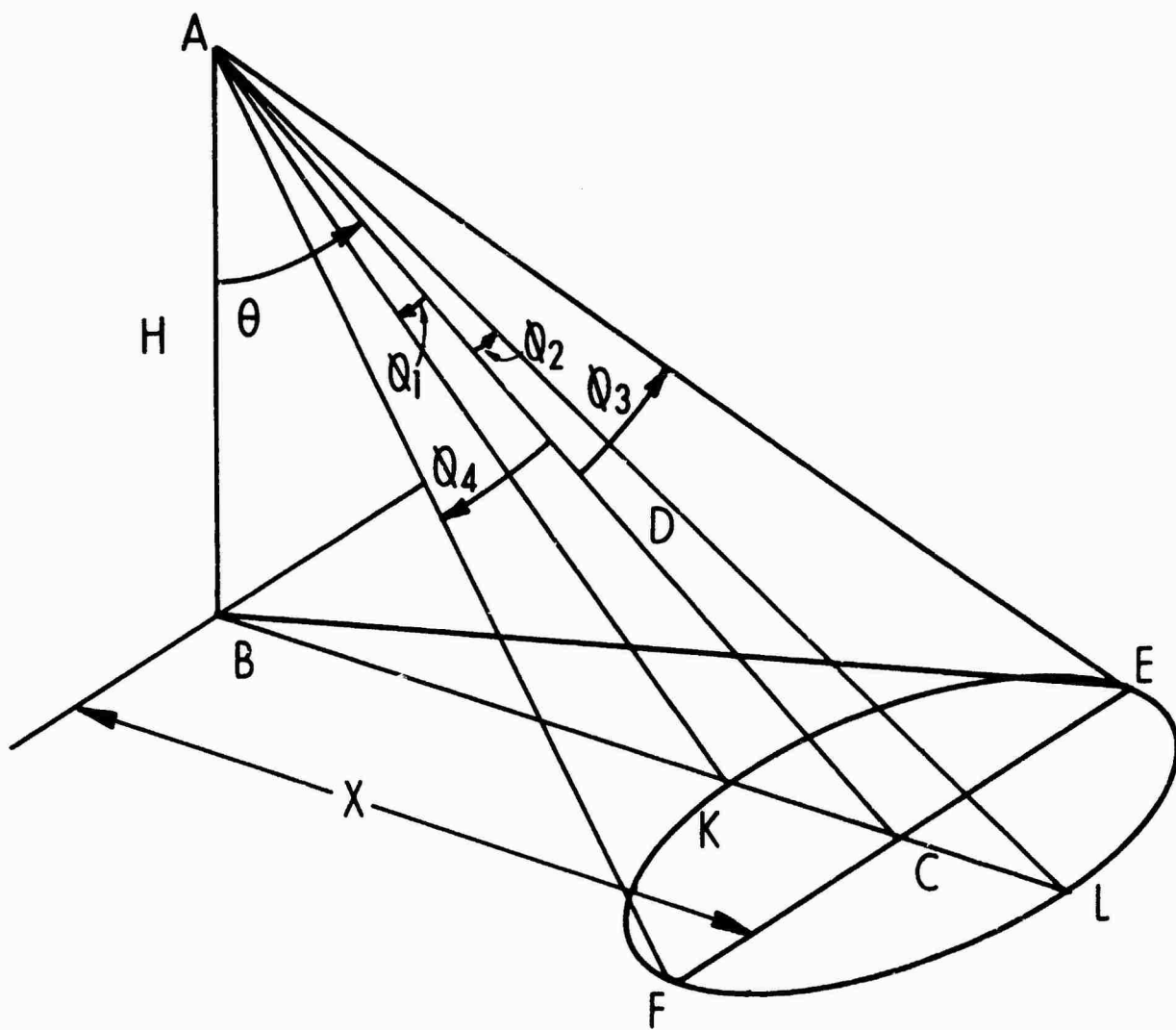


Figure 13
Two-Axis Geometry of the Template Method

Referring to figure 13, angles θ ($\angle BAC$), ϕ_1 ($\angle KAC$) and ϕ_2 ($\angle CAL$) are measured in the vertical plane (plane containing the points ABKCL). Angles ϕ_4 ($\angle FAC$) and ϕ_3 ($\angle CAE$) are measured in the inclined plane (plane containing the points AFCE). The horizontal plane is that plane containing the points BKCLFE. The fixture is assumed to be positioned at point A, a distance of H feet above the horizontal plane. The main axis of the light beam of the lamp, line AC, is directed downward, making an angle of θ degrees with line AB in the vertical plane. Angle θ is called the aiming angle.

The light pattern produced by the lamp is considered to be an ellipse in the horizontal plane having points FE and KL as points on its major and minor diameters and point C as its center.

The illumination along line \overline{KL} has been calculated for values of H in increments of 4 feet, θ in increments of 5° , and θ_1 in increments of 2.5° using the candlepower distribution curves of the lamps in the vertical beam pattern and the formula:

$$E = \left[CP | \phi_1 \right] \left[\% \text{ RED} \right] \frac{\cos^3 (\theta + \phi_1)}{H^2} .$$

Similarly the illumination along line \overline{FE} has been calculated from the candlepower distribution curves of the lamp in the horizontal beam pattern with similar increments in the various values and the formula:

$$E = \left[CP | \phi_3, \right] \left[\% \text{ RED} \right] \frac{H}{GG_{\phi_3}^3} ,$$

where

E = illumination on the deck in foot-candles

$\left[CP | \phi_1 \text{ or } 2 \right]$ = candlepower of the lamp at an angle ϕ_1
from the beam axis in the vertical beam pattern

$\left[CP | \phi_3 \text{ or } 4 \right]$ = candlepower of the lamp at an angle $\phi_3 \text{ or } 4$
from the beam axis in the horizontal beam pattern

$\left[\% \text{ RED} \right]$ = percentage of the total light that the
red filter transmits

θ = (lamp aiming angle) the vertical angle
between the beam axis of the lamp (line AC and the vertical line
from the horizontal plane to the focus of the lamp

H = (mounting height) distance from the horizontal plane to the focus of the lamp in feet

GG_{ϕ_i} = distance from the focus of the lamp to the horizontal plane along the ray which makes an angle ϕ_i with the beam axis AC.

The illumination within the ellipse is nonuniform, having its maximum value somewhere near C, on the line between K and C and decreasing in magnitude as the position is moved radially away from point C. Points KFLE are points at which the minimum allowable illumination (0.2 ft-c) exists. Line \overline{KL} is designated as the radial or vertical diameter of the ellipse, and line \overline{FE} is designated as the transverse or horizontal diameter of the ellipse.

To derive a more accurate plot of the deck illumination pattern, it is desirable to consider two additional axes which are 45° off the vertical axis of the lamp. In figure 12, these axes yield points M, N, R, and S.

If candlepower distributions are not available for these additional axes, the tabular data output from the computer program will be limited to horizontal and vertical axes only which were previously addressed; the discussion which follows (plus figures 14, 15, and 16) will not apply.

Figure 14 gives the geometry for the oblique axes considered in the four-axis method. Angles ϕ_5 ($\angle CAM$) and ϕ_6 ($\angle CAS$) are measured in the oblique plane containing the points SACM, which we shall refer to as the 135° oblique plane. Angles ϕ_7 ($\angle CAN$) and ϕ_8 ($\angle CAR$) are in the plane containing the points RANC, which we shall refer to as the 45° oblique plane. The illumination along the line RN has been calculated using the candlepower distribution curves of the lamps in the 135° beam pattern and the formula:

$$E = \left[\frac{CP}{\phi_7 \text{ or } 8} \right] \left[\frac{\% \text{ RED}}{GG_{\phi_7 \text{ or } 8}^3} \right] \frac{H}{GG_{\phi_7 \text{ or } 8}^3},$$

where $GG_{\phi_7 \text{ or } 8}$ = distance from A to the horizontal plane
 along the ray at angle ϕ_7 or ϕ_8 .

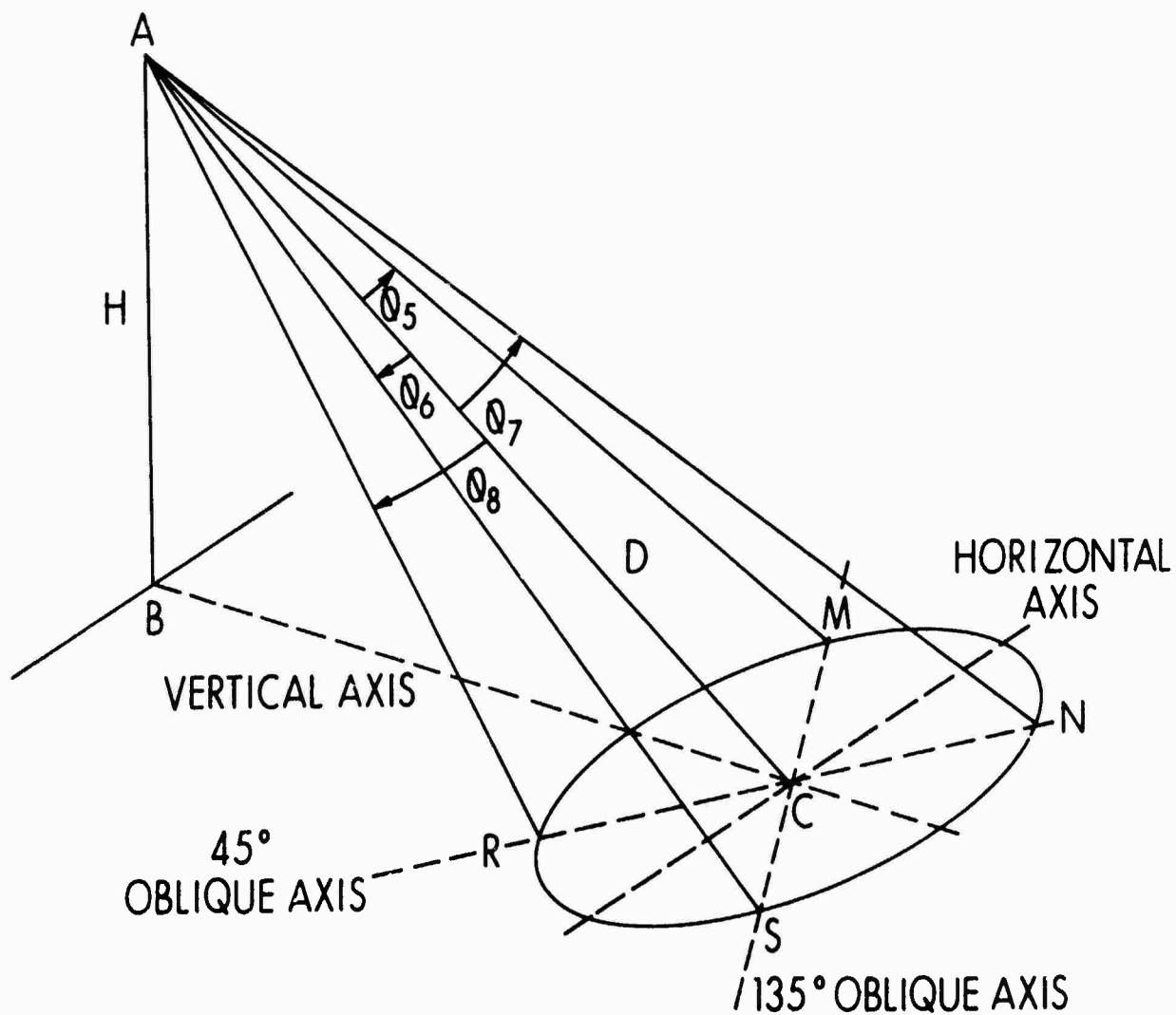


Figure 14
 Oblique Axes Geometry

Figure 15 shows the geometry involved. Angle ϕ_8 is set in increments of 2.5° in accordance with the known candlepower distribution inputs.

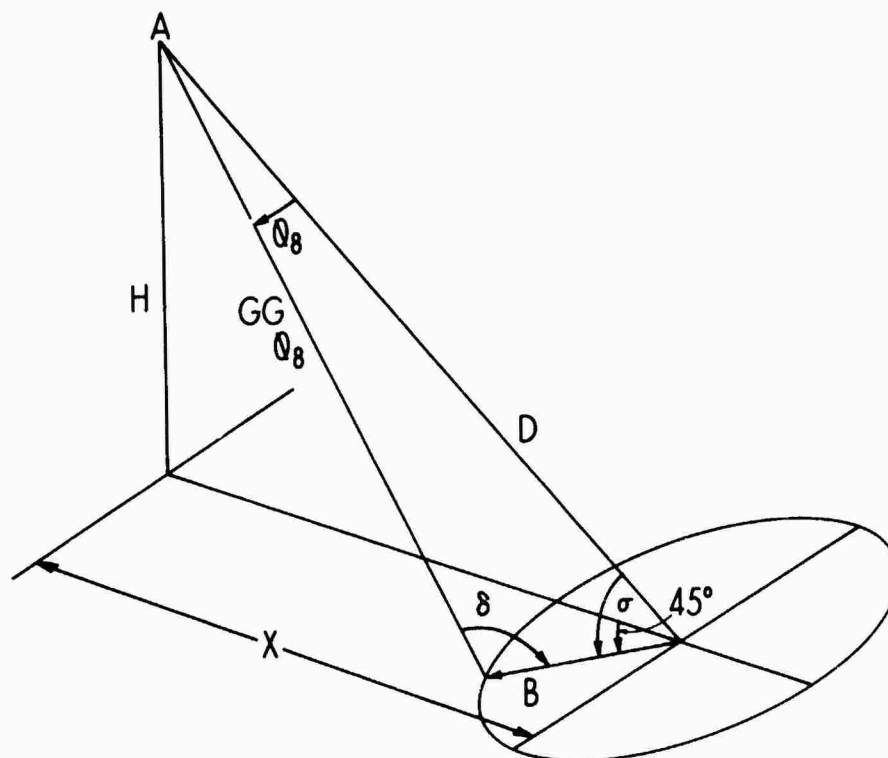


Figure 15
Bottom Right on 135° Oblique Axis

The distance D is known, as is H . To find GG_{ϕ_8} we must construct two vectors as shown in figure 16. The first vector $A = -xi + 0j + Hk$ lies in the vertical plane and goes from the center spot C to the lamp position. The second vector $B = -bi + bj + 0k$ lies in the horizontal plane along the 135° oblique axis from the center to the end point of the ray at angle ϕ_8 in figure 15.

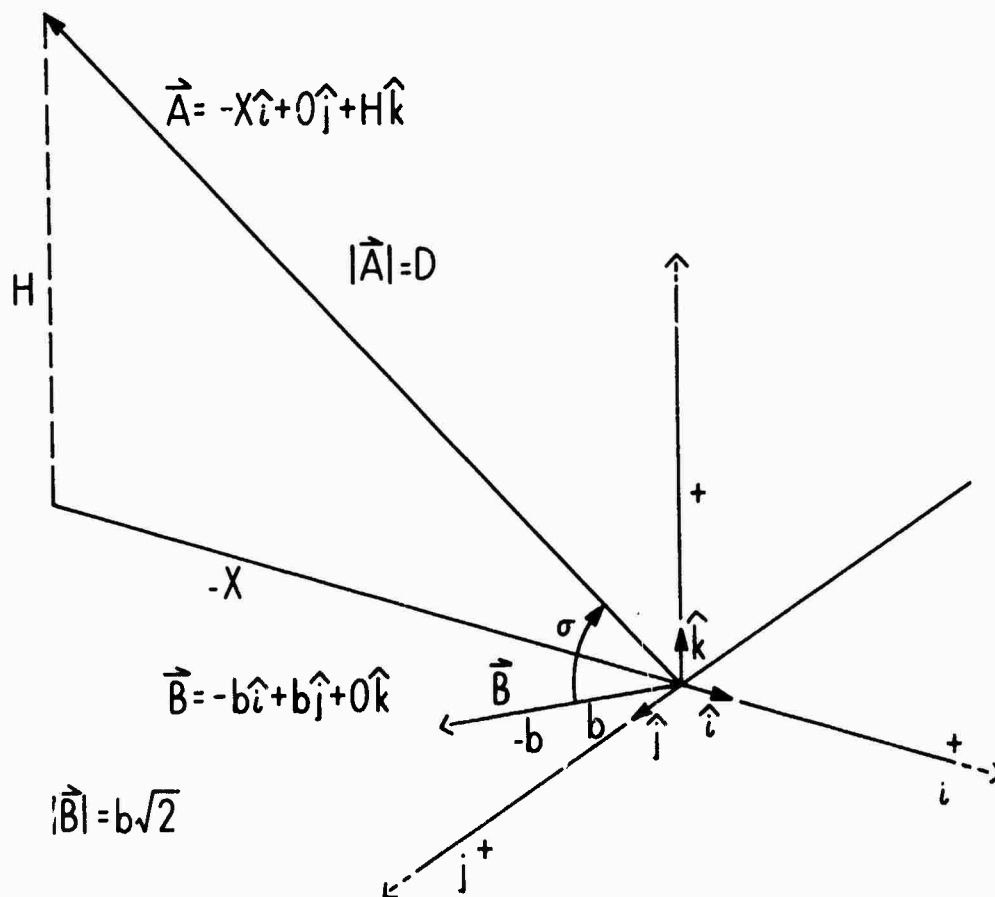


Figure 16
Vector Construct to Determine Distances and
Illumination Along Oblique Axes

It follows that

$$\begin{aligned}\vec{A} \cdot \vec{B} &= |\vec{A}| |\vec{B}| \cos \sigma \\ bx &= \sqrt{x^2 + H^2} \sqrt{b^2 + b^2} \cos \sigma \\ bx &= D b \sqrt{2} \cos \sigma \\ \cos \sigma &= \frac{\frac{x}{\sqrt{2}}}{D} \\ \sigma &= \cos^{-1} \left(\frac{\frac{x}{\sqrt{2}}}{D} \right).\end{aligned}$$

In figure 15, δ must then equal $(180 - (|\phi_8| + |\sigma|))$.
Once all the angles are known, we can solve for GG_{ϕ_8} using the
law of sines.

$$\frac{GG_{\phi_8}}{\sin \sigma} = \frac{D}{\sin \delta} = \frac{b\sqrt{2}}{\sin \phi_8}$$

$$GG_{\phi_8} = \frac{D \sin \sigma}{\sin \delta}$$

The distance from the center spot along the oblique axis can also now be solved for:

$$b \sqrt{2} = \frac{D \sin \phi_8}{\sin \delta}$$

A similar analysis follows for each of the three quadrants along the oblique axes. In this manner, the illumination is calculated along the four axes, and an illumination profile may be obtained showing the light levels throughout the interior of the template area.

LAMPS, FIXTURES AND FILTERS FOR UNREP

The Navy stock fixture symbol 263, FSN 6210-878-1131-D336, as shown in figure 17 was chosen for underway replenishment night lighting of supply ships because it had the following outstanding features:

- Relatively small size.
- Waterproof.
- Steel construction (relatively noncorrosive).
- Ease of relamping.
- Large glare shield.
- Standard filter holder.
- Rigid mounting.
- Rigid, all position aiming.



Figure 17
Navy Stock Fixture Symbol 263

The red filter to be used in conjunction with this luminaire is designated as No. 6350 as manufactured by the Kopp Glass Company. It was chosen because it has a sharp cutoff point around 600 nanometers (nm) and will transmit no light of wavelength shorter than this. This quality of red light provides excellent dark adaptation. A spectral transmittance curve of the filter is given in figure 18.

The lamps under consideration for UNREP lighting are PAR lamps. For the large spaces and great mounting heights available on supply ships, high intensity 300-watt PAR 56 lamps are available in WFL, MFL, and NSP beam configurations. This range of lamp choice allows a complete lighting system to be designed from a single type of luminaire with various types of lamps. Template method calculations for each of these types are included in appendix A.

On supply ships, available mounting heights range as high as 50 feet. On destroyers and other ships which must be replenished at sea, however, such heights are not available. Consequently, for the needs of these ships, 300-watt lamps must be bypassed; consideration should be given to smaller lamps such as 75, 100, and 150 watt.

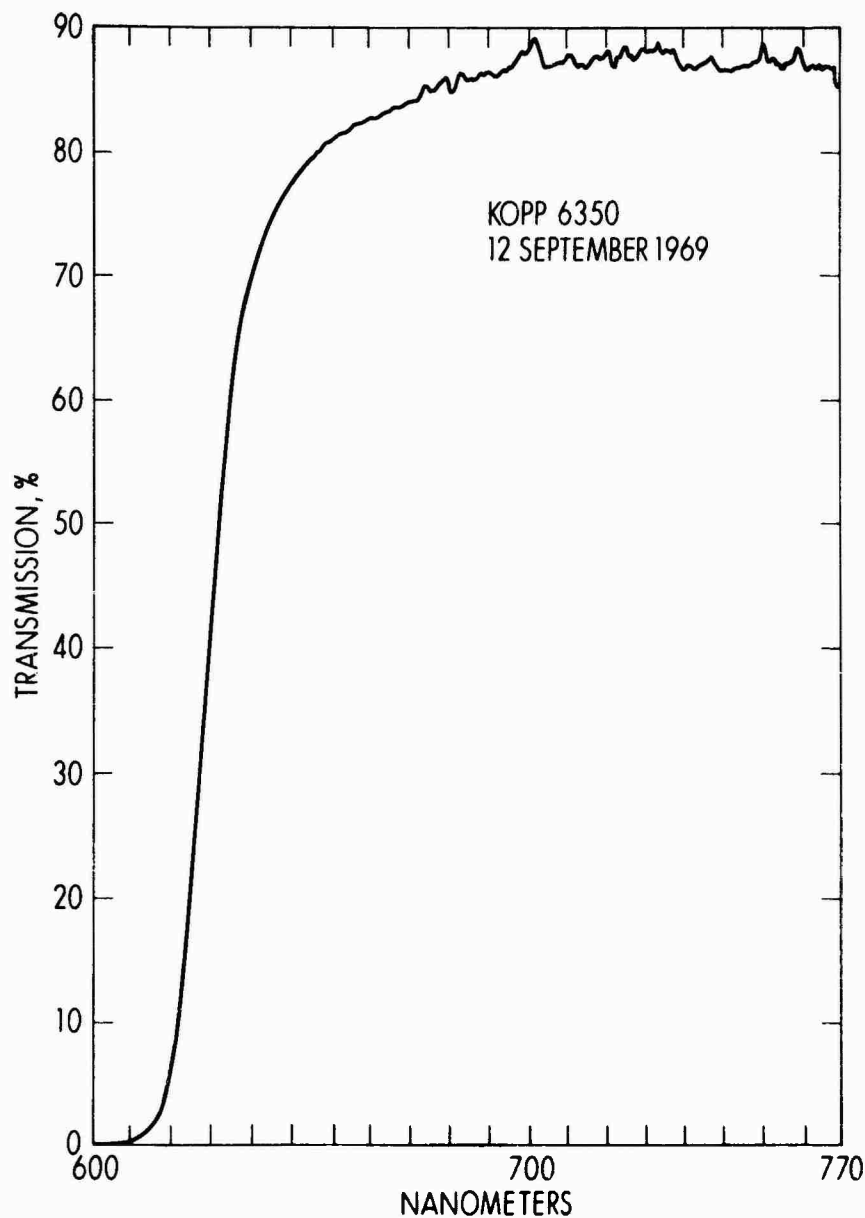


Figure 18
Spectral Transmittance

CONCLUSIONS AND RECOMMENDATIONS

This report has described a method of designing red illumination systems for night UNREP operations. This method is also applicable to the design of any illumination system which will use overhead mounted point source types of luminaires.

The method and data addressed in this report were detailed for use with a single militarized lighting fixture (Symbol 263) which was determined under this task to be adequate for use on Fleet supply ships. It is suggested that information regarding this method be introduced to naval ship designers and inspectors for use in the design of lighting systems and also in the ship-board verification of those designs.

It has also been suggested that the template method be used as an analytical tool when investigating lighting system designs which may indicate the use of special lamps and the development of new lighting fixtures. When phantom designs for the new fixtures are prepared and the corresponding illumination levels are adequately described then the following comparison tradeoffs can be made between these phantom fixture/lamp combinations and the reported symbol 263 fixture/lamps: number of fixtures/lamps required, uniformity of illumination in the work area, available mounting heights for fixtures, and power requirements. Examination of these tradeoffs can determine in advance whether the development of a new fixture is really warranted. If the new fixtures are needed, then detailed patterns or templates can be prepared as outlined herein for the Symbol 263 fixture.

In completing this task it became apparent that the Symbol 263 light fixtures were not adequate for use in the design of lighting systems for combatant-type ships. A preprototype fixture, based upon a miniaturized Symbol 263 fixture, was constructed to illustrate the illumination patterns which can be expected when employing Symbol 263 features in combination with 75-, 100-, and 150-watt PAR type tungsten lamps. Template method data for these preprototype fixture/lamp combinations are available at the NAVSHIPRANDCEN Annapolis along with candlepower distribution data for all available types (flood and spot) of the following PAR lamps (bare lamp not mounted) in any fixture; 75, 100, 150, 300, and 500 watt. This data would be useful in examining the tradeoffs of the preprototype fixture or any fixture employing available PAR-type tungsten lamps and can be made available if desired.

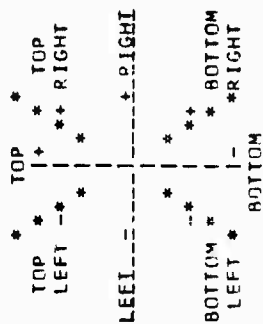
Appendix A

UNREP Lighting Data

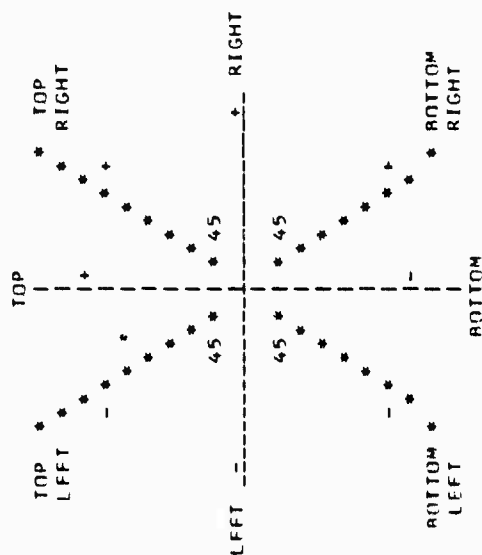
(A Set of Data Tables for UNREP Lighting,
i.e., 300-Watt PAR 56 Wide Flood, Medium Flood,
and Narrow Spot, in the Symbol 263 Fixture)

LAMP - 200 WATT NARROW SPOT
 FIXTURE - SYMBOL #263

TRANSMISSION FACTOR - 0.150
 (PER CENT $\eta_{(0)}$)



		VERTICAL AXIS				HORIZONTAL AXIS			
		TOP		BOTTOM		LEFT		RIGHT	
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MOUNTING POLE

300 WATT NARROW SPOT SYMBOL #263

APPROXIMATE ILLUMINATION PROFILE

100 WATT NARROW SPOT SYMBOL #263

HEIGHT = 40 FEET
 THETA = 45 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 40.00
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-14.52	0.05
-11.99	0.14
-9.31	0.57
-6.44	1.35
-3.35	2.36
0.0	2.48
3.65	1.08
7.67	0.33
12.13	0.09
17.13	0.02

RADIAL "DIAMETER" = 12.13 + 11.99 = 24.12

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.84	0.07
10.45	0.19
7.99	0.47
5.44	1.11
2.78	2.38
0.0	2.82
-2.93	1.41
-6.02	0.63
-9.31	0.19
-12.82	0.06

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
15.16	0.05
12.54	0.20
9.97	0.63
7.45	1.05
4.95	1.53
2.47	2.46
0.0	2.20
-2.47	1.63

MOUNTING HEIGHT = 40 FEET MOUNTING ANGLE, THETA = 45 DEGREES

TRANSVERSE "DIAMETER" = 12.54 + 9.97 = 22.52

300 WATT NARROW SPOT SYMBOL #263

-4.95 1.33
-7.45 0.55
-9.97 0.14
-12.54 0.04

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-10.45 0.06
-7.99 0.23
-5.44 0.70
-2.78 1.38
0.0 2.08
2.93 2.20
6.02 1.02
9.31 0.45
12.82 0.13
16.61 0.03

300 WATT NARROW SPOT SYMBOL #263

HEIGHT = 44 FEET
 THETA = 45 DEGRFES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 44.00
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-15.97	0.04
-13.19	0.11
-10.24	0.47
-7.08	1.11
-3.68	1.95
0.0	2.05
4.02	0.90
8.44	0.28
13.34	0.07

RADIAL "DIAMETER" = 8.44 + 13.19 = 21.63

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.12	0.06
11.50	0.15
8.79	0.39
5.98	0.92
3.06	1.97
0.0	2.33
-3.22	1.17
-6.62	0.52
-10.24	0.16
-14.11	0.05

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.67	0.04
13.80	0.17
10.97	0.52
8.19	0.87
5.44	1.27
2.77	2.03
0.0	1.81
-2.72	1.35
-5.44	1.10

100 WATT NARROW SPOT SYMBOL #263

HEIGHT = 48 FFET DISTANCE FROM BASE OF POLE TO CENTER SPOT = 40.28
 THETA = 40 DEGREES PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-15.29	0.04
-12.56	0.11
-9.70	0.48
-6.67	1.15
-3.45	2.04
0.0	2.19
3.71	0.98
7.72	0.31
12.11	0.08

RADIAL "DIAMETER" = 7.72 + 12.56 = 20.29

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.01	0.05
11.38	0.16
8.68	0.40
5.89	0.96
3.00	2.08
0.0	2.49
-3.14	1.26
-6.44	0.57
-9.93	0.17
-13.63	0.05

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.79	0.05
13.89	0.18
11.05	0.56
8.25	0.93
5.48	1.35
2.74	2.17
0.0	1.94
-2.74	1.44
-5.48	1.17

MOUNTING HEIGHT = 4.8 FEET MOUNTING ANGLE, θ = 40 DEGREES

TRANSVERSE "DIAMETER" = $13.80 + 11.05 = 24.94$

300 WATT NARROW SPOT SYMBOL #263

-8.25	0.48
-11.05	0.13
-13.89	0.04

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.38	0.05
-8.68	0.20
-5.89	0.61
-3.00	1.21
0.0	1.83
3.14	1.96
6.44	0.92
9.93	0.41
13.63	0.12
17.58	0.03

300 WATT NARROW SPOT SYMBOL #263

HEIGHT = 48 FEET
 THETA = 45 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 48.00
 PER CENT RED = 0.150

RADIAL "DIAMETER" = $9.20 + 14.39 = 23.59$

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-17.42	0.03
-14.39	0.09
-11.17	0.40
-7.72	0.94
-4.02	1.64
0.0	1.72
4.38	0.75
9.20	0.23
14.55	0.06

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
15.41	0.05
12.54	0.13
9.59	0.32
6.53	0.77
3.34	1.65
0.0	1.96
-3.51	0.98
-7.22	0.44
-11.17	0.13
-15.39	0.04

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
18.19	0.04
15.05	0.14
11.97	0.44
8.94	0.73
5.94	1.06
2.96	1.71
0.0	1.52
-2.96	1.13
-5.94	0.92

MOUNTING HEIGHT = 48 FEET MOUNTING ANGLE, THETA = 45 DEGREES

TRANSVERSE "DIAMETER" = 15.05 + 11.97 = 27.02

300 WATT NARROW SPOT SYMBOL #263

-9.94 0.38
 -11.97 0.10
 -15.05 0.03

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

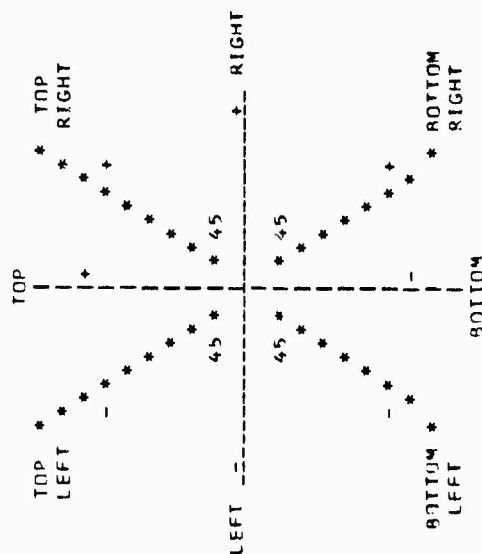
-12.54 0.04
 -9.59 0.16
 -6.53 0.48
 -3.34 0.96
 0.0 1.44
 3.51 1.53
 7.22 0.71
 11.17 0.31
 15.39 0.09
 19.93 0.02

TRANSMISSION FACTOR - 0.150
(PER CENT REF)

**X
MOUNTING POLE**

			VERTICAL AXIS				HORIZONTAL AXIS											
			←-TOP LEFT TO BOTTOM RIGHT→		←-TOP RIGHT TO BOTTOM LEFT→		←-LEFT TO RIGHT→		←-BOTTOM LEFT TO TOP RIGHT→									
H	D	θ	DIR DIST TO ILLUM LEVEL OF	DIP DIST TO ILLUM LEVEL OF	DIR DIST TO ILLUM LEVEL OF	DIP DIST TO ILLUM LEVEL OF	DIR DIST TO ILLUM LEVEL OF	DIP DIST TO ILLUM LEVEL OF	DIR DIST TO ILLUM LEVEL OF	DIP DIST TO ILLUM LEVEL OF	DIR DIST TO ILLUM LEVEL OF	DIP DIST TO ILLUM LEVEL OF	DIR DIST TO ILLUM LEVEL OF	DIP DIST TO ILLUM LEVEL OF				
			0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5	0.2	0.5				
28	28.0	45	-8.4	-6.5	8.5	12.0	-9.0	-9.0	7.3	9.0	-10.6	-8.8	10.6	12.5	-9.0	-7.3	9.0	11.6
32	26.0	40	-8.4	-5.5	8.1	11.3	-9.1	-9.1	7.6	9.3	-11.2	-9.3	11.2	13.2	-9.3	-7.6	9.1	11.7
32	32.0	45	-9.6	-7.4	9.7	13.7	-10.3	-7.4	8.4	10.3	-12.1	-10.0	12.1	14.3	-8.4	-6.4	7.4	10.3
36	25.2	35	-8.4	-6.5	7.8	10.8	-9.2	-9.2	7.9	9.7	-11.8	-9.7	11.8	13.9	-9.7	-7.9	9.2	11.8
36	30.2	40	-9.4	-7.3	9.1	12.7	-10.2	-7.4	8.5	10.5	-12.6	-10.4	12.6	14.8	-8.5	-6.5	7.4	10.2
36	36.0	45	-8.4	-5.8	10.9	10.9	-11.5	-8.4	9.4	11.5	-13.6	-9.0	11.3	13.6	-9.4	-7.2	8.4	11.5
40	18.7	25	-7.9	-6.0	6.8	9.4	-11.0	-8.6	7.7	9.6	-11.8	-9.8	11.8	13.9	-9.6	-7.7	8.6	11.0
40	23.1	30	-8.5	-6.5	7.6	10.5	-9.3	-9.3	8.2	10.1	-12.4	-10.2	12.4	14.6	-8.2	-6.2	9.3	11.9
40	28.0	35	-7.2	-7.2	8.6	12.0	-10.2	-7.5	8.7	10.8	-13.1	-10.8	13.1	15.4	-8.7	-6.6	10.2	10.2
40	33.6	40	-8.1	-5.4	10.1	14.1	-11.4	-8.3	9.5	11.7	-14.0	-9.2	11.6	14.0	-9.5	-7.2	8.3	11.4
40	40.0	45	-9.3	-6.4	7.7	12.1	-12.8	-9.3	8.0	12.8	-15.2	-10.0	12.5	15.2	-10.5	-8.0	9.3	12.8
44	7.8	10	-7.8	-5.8	6.1	8.3	-10.3	-8.1	7.8	9.7	-12.0	-9.9	12.0	14.1	-9.7	-7.8	8.1	10.3
44	11.8	15	-7.9	-6.0	6.4	8.7	-10.7	-8.4	7.9	9.9	-12.2	-10.1	12.2	14.4	-9.9	-7.9	8.4	10.7
44	16.0	20	-9.3	-6.3	6.9	9.4	-11.3	-8.9	8.2	10.1	-12.5	-10.4	12.5	14.8	-8.2	-6.2	8.9	11.3
44	20.5	25	-6.6	-5.6	7.5	10.3	-9.5	-9.5	8.5	10.5	-13.0	-10.8	13.0	15.3	-8.5	-6.4	9.5	12.1
44	25.4	30	-7.2	-4.0	8.4	11.5	-10.3	-7.5	9.0	11.1	-13.6	-11.3	11.3	13.6	-9.0	-6.8	10.3	10.3

44	30.4	35	-7.9	-5.4	9.5	13.2	-11.2	-3.2	9.6	11.9	-14.4	-9.5	11.9	14.4	-9.6	-7.3	8.2	11.2
44	36.9	40	-8.9	-6.1	7.1	11.1	-12.5	-9.1	8.0	12.8	-15.4	-10.1	12.7	15.4	-10.4	-8.0	9.1	12.5
48	6.0	0	-6.3	-6.3	6.3	9.5	-10.6	-8.5	8.5	10.6	-12.9	-10.6	12.9	15.1	-8.5	-6.3	8.5	10.6
48	4.2	5	-6.3	-6.3	6.4	8.7	-10.3	-8.6	8.4	10.6	-12.9	-10.7	12.9	15.2	-8.4	-6.3	8.6	10.9
48	8.5	10	-6.4	-6.4	6.7	9.0	-11.2	-8.9	8.5	10.6	-13.1	-10.8	13.1	15.4	-8.5	-6.4	8.9	11.2
48	12.9	15	-6.5	-6.5	7.2	9.5	-11.7	-9.2	8.6	10.8	-13.3	-11.0	13.3	15.7	-8.6	-6.5	9.2	11.7
48	17.5	20	-6.8	-6.6	7.5	10.2	-9.7	-7.2	8.9	11.1	-13.7	-11.3	13.7	16.1	-8.9	-6.7	9.7	12.4
48	22.4	25	-7.2	-4.9	8.2	11.2	-10.4	-7.6	9.3	11.5	-14.2	-11.7	11.7	14.2	-9.3	-7.0	10.4	10.4
48	27.7	30	-7.8	-5.3	9.1	12.5	-11.2	-8.2	9.8	12.1	-14.9	-9.8	12.3	14.9	-9.8	-7.4	8.2	11.2
48	33.4	35	-8.6	-5.3	10.4	13.4	-12.3	-9.0	8.0	12.9	-15.7	-10.3	13.0	15.7	-10.5	-8.0	9.0	12.3
48	40.3	40	-9.7	-6.7	7.7	12.1	-13.6	-6.4	8.7	11.4	-13.9	-11.0	11.0	16.8	-11.4	-5.9	9.9	13.6



300 WATT PAR56 MFL SYMBOL #263
 AIRRIDGED ILLUMINATION PROFILE

300 WATT PAP56 MEL SYMBOL #263

HEIGHT - 28 FEET
FOOT - 45 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 28.00
PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.14	0.09
-8.39	0.15
-6.51	0.41
-4.51	1.02
-2.34	1.91
0.0	2.27
2.56	2.60
5.37	1.24
8.49	0.50
11.09	0.12
15.95	0.03

RADIAL "DIAMETER" = 11.99 + 8.39 = 20.38

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
10.61	0.10
8.99	0.25
7.32	0.62
5.59	1.20
3.81	1.89
1.95	2.32
0.0	2.35
-2.05	1.96
-4.21	1.37
-6.51	0.76
-8.98	0.29
-11.62	0.08

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
14.41	0.14
12.49	0.11
10.61	0.42
8.78	0.90
6.98	1.37

300 WATT PAR55 MFL SYMORI #263 MOUNTING HEIGHT = 28 FEET MOUNTING ANGLE, THETA = 45 DEGREES

5.21	1.78
3.46	2.17
1.73	2.35
0.0	2.37
-1.73	2.24
-3.46	2.01
-5.21	1.57
-6.98	0.93
-8.78	0.65
-10.61	0.22
-12.49	0.06

TRANSVERSE "DIAMETER" = 12.49 + 10.61 = 23.10

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-10.61	0.07
-9.99	0.13
-7.32	0.36
-5.69	0.93
-3.81	1.50
-1.95	2.03
0.0	2.35
2.05	2.17
4.21	1.57
6.51	0.89
8.98	0.36
11.62	0.11
14.49	0.04

300 WATT PAK56 MFL SYNROL #263

HEIGHT = 32 FEET

THETA = 40 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 26.85

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.19	0.08
-9.38	0.14
-6.46	0.37
-4.44	0.96
-2.30	1.73
0.0	2.21
2.47	1.99
5.15	1.27
8.07	0.52
11.28	0.13
14.95	0.03

RADIAL "DIAMETER" = 11.28 + 8.38 = 19.66

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
11.05	0.10
9.34	0.23
7.59	0.59
5.79	1.14
3.93	1.91
2.00	2.24
0.0	2.29
-2.09	1.93
-4.29	1.36
-6.62	0.76
-9.00	0.29
-11.72	0.09

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
15.20	0.04
13.17	0.10
11.19	0.41
9.26	0.98
7.37	1.36

300 WATT PAR56 MFL SYMRUL #263 MOUNTING HEIGHT = 32 FEET MOUNTING ANGLE, THETA = 40 DEGREES

5.50	1.73
3.65	2.12
1.82	2.29
0.0	2.30
-1.82	2.18
-3.65	1.95
-5.50	1.53
-7.37	0.91
-9.26	0.63
-11.19	0.21
-13.17	0.06

TRANSVERSE "DIAMETER" = 13.17 + 11.19 = 24.36

NOTION LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-11.05	0.07
-9.34	0.12
-7.59	0.24
-5.79	0.78
-3.03	1.44
-2.00	1.96
0.0	2.28
2.09	2.13
4.29	1.56
6.62	0.90
9.09	0.36
11.72	0.11
14.56	0.04

300 WATT PAR56 MEL SYM90L #263

HEIGHT = 32 FEET
 THETA = 45 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 32.00
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-11.61	0.07
-9.59	0.12
-7.45	0.31
-5.15	0.78
-2.68	1.39
0.0	1.74
2.92	1.53
6.14	0.95
9.70	0.38
13.70	0.09
18.23	0.02

RADIAL "DIAMETER" = 13.70 + 9.59 = 23.29

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.13	0.08
10.27	0.19
8.36	0.48
6.39	0.92
4.35	1.45
2.23	1.77
0.0	1.80
-2.34	1.50
-4.81	1.05
-7.45	0.59
-10.26	0.22
-13.29	0.06

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.47	0.03
14.27	0.08
12.13	0.32
10.03	0.69
7.98	1.05

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 32 FEET MOUNTING ANGLE, THETA = 45 DEGREES

5.96	1.36
3.96	1.66
1.98	1.80
0.0	1.81
-1.98	1.72
-3.96	1.54
-5.96	1.21
-7.98	0.71
-10.03	0.49
-12.13	0.17
-14.27	0.05

TRANSVERSE "DIAMETER" = $14.27 + 12.13 = 26.39$

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-10.27	0.10
-8.36	0.27
-6.39	0.63
-4.35	1.15
-2.23	1.55
0.0	1.80
2.34	1.66
4.81	1.21
7.45	0.68
10.26	0.27
13.29	0.08

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 36 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 25.21

THETA = 35 DEGREES

PER CENT REF = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.30	0.08
-8.42	0.12
-6.47	0.34
-4.42	0.89
-2.27	1.64
0.0	2.14
2.42	1.96
5.00	1.27
7.78	0.54
10.79	0.13
14.08	0.04

RADIAL "DIAMETER" = 10.79 + 8.42 = 19.21

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
11.51	0.09
9.70	0.22
7.86	0.55
5.98	1.08
4.05	1.72
2.06	2.14
0.0	2.21
-2.14	1.88
-4.38	1.33
-6.72	0.76
-9.20	0.29
-11.82	0.09

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.00	0.04
13.86	0.10
11.78	0.40
9.74	0.85
7.75	1.29

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 36 FEET MOUNTING ANGLE, THETA = 35 DEGREES

5.79	1.67
3.84	2.04
1.92	2.21
0.0	2.23
-1.92	2.11
-3.84	1.89
-5.79	1.48
-7.75	0.88
-9.74	0.61
-11.78	0.20
-13.86	0.06

TRANSVERSE "DIAMETER" = 13.86 + 11.78 = 25.63

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.51	0.06
-9.70	0.11
-7.86	0.32
-5.98	0.74
-4.05	1.37
-2.06	1.87
0.0	2.21
2.14	2.07
4.38	1.54
6.72	0.89
9.20	0.36
11.82	0.11
14.62	0.04

300 WATT PA456 MEL SYMBOL #263

HEIGHT = 36 FEET

THETA = 40 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 30.21

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-11.47	0.07
-9.42	0.11
-7.27	0.30
-5.00	0.76
-2.58	1.37
0.0	1.75
2.78	1.57
5.79	1.00
9.08	0.41
12.70	0.10
16.71	0.03

RADIAL "DIAMETER" = 12.70 + 9.42 = 22.12

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.44	0.08
10.51	0.18
8.53	0.46
6.51	0.90
4.42	1.43
2.25	1.77
0.0	1.80
-2.36	1.52
-4.83	1.07
-7.45	0.60
-10.22	0.23
-13.19	0.07

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.10	0.03
14.82	0.08
12.59	0.33
10.42	0.69
8.29	1.06

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 36 FEET MOUNTING ANGLE, THETA = 40 DEGREES

6.19 1.37
 4.11 1.67
 2.05 1.81
 0.0 1.82
 -2.05 1.73
 -4.11 1.54
 -6.19 1.21
 -8.29 0.72
 -10.42 0.50
 -12.59 0.17
 -14.82 0.05

TRANSVERSE "DIAMETER" = 14.82 + 12.59 = 27.41

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-10.51	0.09
-8.53	0.27
-6.51	0.62
-4.42	1.14
-2.25	1.55
0.0	1.80
2.36	1.68
4.83	1.23
7.45	0.71
10.22	0.29
13.19	0.09

300 WATT PAR56 MEL SYMBOL #263

HEIGHT = 36 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 36.00

THETA = 45 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.79	0.09
-9.38	0.25
-5.79	0.62
-3.01	1.10
0.0	1.38
3.29	1.21
6.90	0.75
10.92	0.30
15.41	0.07

RADIAL "DIAMETER" = 10.92 + 8.38 = 19.29

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
13.64	0.06
11.55	0.15
9.41	0.38
7.19	0.73
4.90	1.14
2.50	1.40
0.0	1.42
-2.63	1.19
-5.42	0.83
-8.38	0.46
-11.54	0.18
-14.95	0.05

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.05	0.06
13.64	0.26
11.29	0.54
8.98	0.83
6.70	1.08
4.45	1.31
2.22	1.42

300 WATT PAR56 WFL SYMROL #263 MOUNTING HEIGHT = 36 FEET MOUNTING ANGLE, THETA = 45 DEGREES

0.0	1.43
-2.22	1.36
-4.45	1.21
-6.70	0.95
-8.98	0.56
-11.29	0.39
-13.64	0.13
-16.05	0.04

TRANSVERSE "DIAMETER" = 13.64 + 13.64 = 27.28

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
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-11.55	0.08
-9.41	0.22
-7.19	0.50
-4.90	0.91
-2.50	1.23
0.0	1.42
2.63	1.31
5.42	0.95
8.38	0.54
11.54	0.22
14.95	0.06

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 40 FEET
 THETA = 25 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 18.65
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.78	0.07
-7.93	0.12
-6.04	0.35
-4.09	0.92
-2.08	1.75
0.0	2.35
2.17	2.22
4.44	1.49
6.83	0.65
9.36	0.17
12.04	0.05

RADIAL "DIAMETER" = 9.36 + 7.93 = 17.29

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
11.43	0.09
9.59	0.22
7.73	0.56
5.85	1.12
3.94	1.82
1.99	2.31
0.0	2.42
-2.05	2.10
-4.16	1.52
-6.35	0.88
-8.63	0.35
-11.02	0.11
-13.53	0.03

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.06	0.05
13.92	0.11
11.83	0.44
9.78	0.93

300 WATT PAR56 MFL SYMROL #263 MOUNTING HEIGHT = 40 FEET MOUNTING ANGLE, THETA = 25 DEGREES

7.78	1.42
5.81	1.94
3.85	2.24
1.93	2.43
0.0	2.44
-1.93	2.31
-3.84	2.07
-5.81	1.62
-7.78	0.96
-9.74	0.67
-11.83	0.22
-13.92	0.06

TRANSVERSE "DIAMETER" = $13.92 \div 11.83 = 25.74$

NOTION LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
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-11.43	0.06
-9.59	0.11
-7.73	0.33
-5.85	0.77
-3.84	1.45
-1.99	2.07
0.0	2.42
2.05	2.52
4.16	1.75
6.35	1.03
8.63	0.43
11.02	0.13
13.53	0.05

300 WATT PAR54 MFL SYMBOL #263

WEIGHT = 40 FEET
 THETA = 30 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 23.09
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.48	0.07
-8.54	0.11
-6.53	0.32
-4.44	0.83
-2.27	1.55
0.0	2.05
2.39	1.91
4.91	1.26
7.60	0.54
10.47	0.14
13.56	0.04

RADIAL "DIAMETER" = 10.47 + 8.54 = 19.01

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.01	0.08
10.10	0.20
8.16	0.51
6.19	1.00
4.18	1.62
2.12	2.03
0.0	2.11
-2.19	1.81
-4.47	1.30
-6.84	0.74
-9.33	0.29
-11.95	0.09

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.81	0.04
14.56	0.10
12.38	0.38
10.24	0.81
8.14	1.24

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 40 FEET MOUNTING ANGLE, THETA = 30 DEGREES

6.08	1.60
4.04	1.96
2.02	2.12
0.0	2.13
-2.02	2.02
-4.04	1.81
-6.08	1.42
-8.14	0.94
-10.24	0.58
-12.38	0.20
-14.56	0.06

TRANSVERSE "DIAMETER" = 14.56 + 12.38 = 26.94

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-10.10	0.10
-8.16	0.29
-6.19	0.69
-4.18	1.29
-2.12	1.78
0.0	2.11
2.19	2.00
4.47	1.50
6.84	0.88
9.33	0.36
11.95	0.11
14.72	0.04

300 WATT DAP56 MEL SYMPOI #263

HEIGHT = 40 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 28.01

THETA = 35 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.36	0.10
-7.19	0.28
-4.91	0.72
-2.53	1.33
0.0	1.73
2.68	1.59
5.56	1.03
8.64	0.43
11.99	0.11
15.64	0.03

RADIAL "DIAMETER" = 11.99 + 7.19 = 19.18

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.79	0.07
10.78	0.17
8.74	0.44
6.64	0.87
4.50	1.39
2.29	1.73
0.0	1.79
-2.38	1.52
-4.86	1.08
-7.47	0.61
-10.22	0.24
-13.14	0.07

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.77	0.03
15.40	0.08
13.08	0.32
10.83	0.69
8.61	1.05
6.43	1.36

300 WATT PAR56 MFL SYMROL #263 MOUNTING HEIGHT = 40 FEET MOUNTING ANGLE, THETA = 35 DEGREES

4.27 1.66
 2.13 1.79
 0.0 1.80
 -2.13 1.71
 -4.27 1.53
 -6.43 1.20
 -8.61 0.71
 -10.3 0.49
 -13.08 0.17
 -15.40 0.05

TRANSVERSE "DIAMETER" = 15.40 + 13.08 = 28.48

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-10.78 0.09
 -8.74 0.26
 -6.64 0.60
 -4.50 1.11
 -2.29 1.52
 0.0 1.79
 2.38 1.68
 4.86 1.24
 7.47 0.72
 10.22 0.29
 13.14 0.09

300 WATT PAR56 MFL SYMROL #263

HEIGHT = 40 FEET
 THETA = 40 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 33.56
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.47	0.09
-8.08	0.24
-5.56	0.61
-2.87	1.11
0.0	1.42
3.09	1.27
6.44	0.81
10.09	0.33
14.11	0.08
18.56	0.02

RADIAL "DIAMETER" = 14.11 + 8.08 = 22.19

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
13.82	0.06
11.68	0.15
9.48	0.37
7.23	0.73
4.91	1.16
2.50	1.43
0.0	1.46
-2.62	1.23
-5.37	0.87
-8.27	0.49
-11.36	0.19
-14.65	0.06

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.46	0.07
13.99	0.26
11.59	0.56
9.21	0.86
6.87	1.11
4.57	1.35

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 40 FEET MOUNTING ANGLE, THETA = 40 DEGREES

2.28	1.47
0.0	1.48
-2.28	1.40
-4.57	1.25
-6.87	0.98
-9.21	0.58
-11.58	0.40
-13.99	0.14
-16.46	0.04

TRANSVERSE "DIAMETER" = 13.99 + 13.99 = 27.98

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.68	0.08
-9.48	0.22
-7.23	0.50
-4.91	0.92
-2.50	1.25
0.0	1.46
2.62	1.36
5.37	1.00
8.27	0.57
11.36	0.23
14.65	0.07

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 40 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 40.00

THETA = 45 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-11.39	0.07
-9.11	0.20
-6.44	0.50
-3.35	0.89
0.0	1.11
3.65	0.98
7.67	0.61
12.13	0.24
17.13	0.06

RADIAL "DIAMETER" = 12.13 + 9.31 = 21.44

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
15.16	0.05
12.84	0.12
10.45	0.30
7.99	0.59
5.44	0.93
2.78	1.14
0.0	1.15
-2.93	0.96
-6.02	0.67
-9.31	0.37
-12.82	0.14
-16.61	0.04

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.84	0.05
15.16	0.21
12.54	0.44
9.97	0.67
7.45	0.87
4.95	1.06
2.47	1.15

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 40 FEET MOUNTING ANGLE, THETA = 45 DEGREES

0.0
-2.47
-4.95
-7.45
-9.97
-12.54
-15.16
-17.84

1.16
1.10
0.98
0.77
0.46
0.32
0.11
0.03

TRANSVERSE "DIAMETER" = 15.16 + 15.16 = 30.31

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-12.84
-10.45
-7.99
-5.44
-2.78
0.0
2.93
5.02
9.31
12.82
16.61

0.06
0.18
0.40
0.74
0.99
1.15
1.06
0.77
0.44
0.17
0.05

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 44 FEET DISTANCE FROM BASE OF POLE TO CENTER SPOT = 7.76

THETA = 10 DEGREES PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.68	0.06
-7.76	0.11
-5.84	0.33
-3.91	0.91
-1.97	1.78
0.0	2.49
2.00	2.44
4.03	1.71
6.11	0.78
8.26	0.21
10.47	0.06

RADIAL "DIAMETER" = 8.26 + 7.76 = 16.01

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
11.68	0.08
9.71	0.21
7.77	0.54
5.83	1.11
3.90	1.84
1.96	2.39
0.0	2.57
-1.98	2.28
-3.98	1.69
-6.03	1.00
-8.12	0.41
-10.26	0.13
-12.49	0.04

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.26	0.05
14.09	0.12
11.97	0.46
9.91	0.99

300 WATT PAR56 WFL SYMBOL #263 MOUNTING HEIGHT = 44 FEET MOUNTING ANGLE, THETA = 10 DEGREES

7.88	1.50
5.89	1.95
3.91	2.38
1.95	2.57
0.0	2.59
-1.95	2.45
-3.91	2.19
-5.88	1.72
-7.88	1.02
-9.91	0.71
-11.97	0.24
-14.09	0.07

TRANSVERSE "DIAMETER" = 14.09 + 11.97 = 26.06

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-11.68	0.06
-9.71	0.10
-7.77	0.31
-5.83	0.76
-3.90	1.46
-1.96	2.09
0.0	2.57
1.98	2.52
3.98	1.95
6.03	1.18
8.12	0.50
10.26	0.16
12.48	0.06

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 44 FEET

THETA = 15 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 11.79

PER CENT REF = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.87	0.06
-7.94	0.11
-6.00	0.32
-4.03	0.88
-2.04	1.70
0.0	2.35
2.08	2.28
4.22	1.58
6.44	0.71
8.73	0.19
11.12	0.06

RADIAL "DIAMETER" = 8.73 + 7.94 = 16.67

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
11.83	0.08
9.87	0.20
7.91	0.53
5.95	1.07
3.99	1.77
2.01	2.27
0.0	2.42
-2.04	2.13
-4.12	1.57
-6.25	0.92
-8.45	0.37
-10.71	0.12
-13.07	0.04

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.58	0.05
14.36	0.11
12.21	0.44
10.10	0.93

300 WATT PAR56 MEL SYMBOL #263 MOUNTING HEIGHT = 44 FEET MOUNTING ANGLE, THETA = 15 DEGREES

8.03	1.42
6.00	1.84
3.99	2.24
1.99	2.43
0.0	2.44
-1.99	2.32
-3.99	2.07
-6.00	1.62
-8.03	0.96
-10.10	0.67
-12.21	0.22
-14.16	0.06

TRANSVERSE "DIAMETER" = 14.36 + 12.21 = 26.57

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.83	0.05
-9.87	0.10
-7.91	0.31
-5.95	0.74
-3.99	1.40
-2.01	1.99
0.0	2.42
2.04	2.36
4.12	1.81
6.25	1.09
8.45	0.46
10.71	0.14
13.07	0.06

300 WATT PAR56 MEL SYMBOL #263

HEIGHT = 44 FEET

THETA = 20 DEGREES

DISTANCE FROM BASE OF PULF TO CENTER SPOT = 16.01

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.22	0.06
-8.26	0.11
-6.26	0.31
-4.22	0.83
-2.14	1.59
0.0	2.16
2.21	2.07
4.50	1.41
6.89	0.63
9.39	0.16
12.02	0.05

RADIAL "DIAMETER" = 9.39 + 8.26 = 17.64

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.12	0.08
10.14	0.19
8.15	0.50
6.15	1.01
4.13	1.65
2.08	2.11
0.0	2.23
-2.13	1.95
-4.32	1.42
-6.57	0.83
-8.90	0.33
-11.32	0.10
-13.86	0.03

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.04	0.04
14.76	0.10
12.55	0.40
10.38	0.86

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 44 FEET MOUNTING ANGLE, THETA = 20 DEGREES

6.26	1.30
6.16	1.69
4.10	2.07
2.04	2.24
0.0	2.25
-2.04	2.13
-4.10	1.91
-6.16	1.50
-8.26	0.89
-10.38	0.61
-12.55	0.21
-14.76	0.06

TRANSVERSE "DIAMETER" = 14.76 + 12.55 = 27.31

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
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-10.14	0.10
-8.15	0.29
-6.15	0.69
-4.13	1.31
-2.08	1.85
0.0	2.23
2.13	2.15
4.32	1.64
6.57	0.97
8.90	0.41
11.32	0.13
13.86	0.05

100 WATT PAR56 MEL SYMBOL #263

HEIGHT = 44 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 20.52

TMFTA = 25 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.73	0.10
-5.64	0.29
-4.50	0.76
-2.29	1.44
0.0	1.94
2.39	1.83
4.89	1.23
7.51	0.54
10.29	0.14
13.24	0.04

RADIAL "DIAMETER" = 10.29 + 6.64 = 16.94

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.58	0.07
10.55	0.18
8.50	0.47
6.43	0.93
4.33	1.51
2.19	1.91
0.0	2.00
-2.25	1.73
-4.58	1.25
-6.99	0.72
-9.49	0.29
-12.12	0.09

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.67	0.04
15.31	0.09
13.01	0.35
10.76	0.77
8.56	1.17
6.39	1.52

300 WATT PAR56 MFL SYMROL #263 MOUNTING HEIGHT = 44 FEET MOUNTING ANGLE, THETA = 25 DEGREES

4.25	1.85
2.12	2.01
0.0	2.02
-2.12	1.91
-4.25	1.71
-6.39	1.34
-8.56	0.90
-10.76	0.55
-13.01	0.19
-15.31	0.05

TRANSVERSE "DIAMETER" = 15.31 + 13.01 = 28.32

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-10.55	0.09
-8.50	0.27
-6.43	0.64
-4.33	1.20
-2.19	1.67
0.0	2.00
2.25	1.91
4.58	1.44
6.99	0.85
9.49	0.35
12.12	0.11
14.88	0.04

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 44 FEET
 THETA = 30 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 25.40
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.39	0.09
-7.18	0.26
-4.89	0.68
-2.50	1.28
0.0	1.69
2.63	1.57
5.41	1.04
8.36	0.45
11.52	0.11
14.92	0.03

RADIAL "DIAMETER" = 11.52 + 7.18 = 18.69

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
13.22	0.07
11.11	0.16
8.98	0.42
6.81	0.83
4.60	1.34
2.33	1.68
0.0	1.75
-2.41	1.50
-4.91	1.07
-7.53	0.62
-10.26	0.24
-13.14	0.07

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.02	0.08
13.61	0.31
11.26	0.67
8.96	1.02
6.69	1.32
4.45	1.62

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 44 FEET MOUNTING ANGLE, THETA = 30 DEGREES

2.22 1.75
 0.0 1.76
 -2.22 1.67
 -4.45 1.49
 -6.69 1.17
 -8.96 0.69
 -11.26 0.48
 -13.61 0.16
 -16.02 0.05

TRANSVERSE "DIAMETER" = 13.61 + 13.61 = 27.23

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-11.11 0.08
 -8.98 0.24
 -6.81 0.57
 -4.60 1.06
 -2.33 1.47
 0.0 1.75
 2.41 1.66
 4.91 1.24
 7.53 0.72
 10.26 0.30
 13.14 0.09

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 44 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 30.81

THETA = 35 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.29	0.08
-7.90	0.23
-5.41	0.60
-2.78	1.10
0.0	1.43
2.95	1.31
6.11	0.85
9.51	0.36
13.19	0.09
17.21	0.03

RADIAL "DIAMETER" = 13.19 + 7.90 = 21.10

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.07	0.06
11.86	0.14
9.61	0.37
7.31	0.72
4.95	1.15
2.52	1.43
0.0	1.48
-2.62	1.26
-5.35	0.89
-8.22	0.51
-11.24	0.20
-14.45	0.06

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.94	0.07
14.39	0.27
11.91	0.57
9.47	0.86
7.07	1.12
4.70	1.37

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 44 FEET MOUNTING ANGLE, THETA = 35 DEGREES

2.35	1.48
0.0	1.49
-2.35	1.41
-4.70	1.26
-7.07	0.99
-9.47	0.59
-11.91	0.41
-14.39	0.14
-16.94	0.04

TRANSVERSE "DIAMETER" = 14.39 + 14.39 = 28.79

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-11.86	0.07
-9.61	0.21
-7.31	0.50
-4.95	0.91
-2.52	1.25
0.0	1.48
2.62	1.39
5.35	1.03
8.22	0.60
11.24	0.24
14.45	0.07

300 WATT PAR56 MFL SYMROL #263

HFLIGHT = 44 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 36.92

THETA = 40 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-11.52	0.07
-8.89	0.20
-6.11	0.51
-3.16	0.91
0.0	1.27
3.40	1.05
7.08	0.67
11.10	0.28
15.52	0.07

RADIAL "DIAMETER" = 11.10 + 8.89 = 19.99

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
15.20	0.05
12.84	0.12
10.43	0.31
7.95	0.60
5.40	0.96
2.75	1.18
0.0	1.21
-2.88	1.02
-5.91	0.72
-9.10	0.40
-12.49	0.16
-16.12	0.05

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
18.11	0.05
15.39	0.22
12.73	0.46
10.13	0.71
7.56	0.92
5.03	1.12
2.51	1.21

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 44 FEET MOUNTING ANGLE, THETA = 40 DEGREES

0.0
-2.51
-5.03
-7.56
-10.13
-12.73
-15.39
-18.11

1.22
.15
1.03
0.81
0.48
0.33
0.11
0.03

TRANSVERSE "DIAMETER" = 15.39 + 15.39 = 30.78

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-12.84
-10.43
-7.95
-5.40
-2.75
0.0
2.88
5.91
9.10
12.49
16.12

0.06
0.18
0.42
0.76
1.03
1.21
1.13
0.83
0.47
0.19
0.06

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 48 FEET
 THETA = 0 DEGREES
 OISTANCE FROM BASE OF POLE TO CENTER SPOT = 0.0
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

OISTANCE	ILLUMINATION
-8.46	0.09
-6.32	0.27
-4.20	0.76
-2.10	1.53
0.0	2.19
2.10	2.20
4.20	1.58
6.32	0.73
8.46	0.20
10.64	0.06

RADIAL "DIAMETER" = 8.46 + 6.32 = 14.78

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

OISTANCE	ILLUMINATION
12.86	0.06
10.64	0.17
8.46	0.45
6.32	0.93
4.20	1.57
2.10	2.07
0.0	2.26
-2.10	2.04
-4.20	1.54
-6.32	0.93
-8.46	0.38
-10.64	0.12
-12.86	0.04

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.47	0.04
15.13	0.10
12.86	0.41
10.64	0.87
8.46	1.32

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 48 FEET MOUNTING ANGLE, THETA = 0 DEGREES

6.32	1.71
4.20	2.09
2.10	2.26
0.0	2.28
-2.10	2.16
-4.20	1.93
-6.32	1.51
-8.46	0.90
-10.64	0.62
-12.86	0.21
-15.13	0.06

TRANSVERSE "DIAMETER" = 15.13 + 12.86 = 28.00

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-10.64	0.08
-8.46	0.26
-6.32	0.64
-4.20	1.25
-2.10	1.81
0.0	2.26
2.10	2.25
4.20	1.77
6.32	1.09
8.46	0.47
10.64	0.15
12.86	0.06

300 WATT PAR56 MFL SYMROL #263

HEIGHT = 48 FEET

THETA = 5 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 4.20

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-8.40	0.09
-6.30	0.28
-4.20	0.77
-2.10	1.53
0.0	2.16
2.12	2.15
4.26	1.52
6.44	0.70
8.66	0.19
10.93	0.06

RADIAL "DIAMETER" = 8.66 + 6.30 = 14.96

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.72	0.07
10.56	0.17
8.42	0.46
6.30	0.94
4.20	1.58
2.10	2.06
0.0	2.23
-2.11	2.00
-4.25	1.49
-6.41	0.90
-8.61	0.37
-10.85	0.12
-13.15	0.04

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.54	0.04
15.19	0.10
12.91	0.40
10.68	0.86
8.50	1.31

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 48 FEET MOUNTING ANGLE, THETA = 5 DEGREES

6.34	1.69
4.22	2.07
2.10	2.24
0.0	2.25
-2.10	2.13
-4.22	1.91
-6.34	1.50
-8.50	0.89
-10.68	0.61
-12.91	0.21
-15.19	0.06

TRANSVERSE "DIAMETER" = 15.19 + 12.91 = 28.10

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
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-10.56	0.09
-8.42	0.26
-6.30	0.65
-4.20	1.25
-2.10	1.80
0.0	2.23
2.11	2.21
4.25	1.72
6.41	1.05
8.61	0.45
10.85	0.15
13.15	0.06

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 48 FEET

THETA = 10 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 8.46

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-8.46	0.09
-6.37	0.28
-4.26	0.76
-2.14	1.50
0.0	2.09
2.18	2.05
4.40	1.44
6.67	0.65
9.01	0.18
11.42	0.05

RADIAL "DIAMETER" = 9.01 + 6.37 = 15.37

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.74	0.07
10.60	0.17
8.47	0.46
6.36	0.93
4.25	1.55
2.13	2.01
0.0	2.16
-2.16	1.91
-4.34	1.42
-6.57	0.84
-8.85	0.34
-11.19	0.11
-13.61	0.04

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.74	0.04
15.37	0.10
13.06	0.39
10.81	0.83
8.59	1.26

MOUNTING HEIGHT = 48 FEET

MOUNTING ANGLE, THETA = 10 DEGREES

300 WATT PAR56 MFL SYMBOL #263

6.42	1.64
4.26	2.00
2.13	2.16
0.0	2.18
-2.13	2.06
-4.26	1.84
-6.42	1.45
-8.59	0.86
-10.81	0.59
-13.06	0.20
-15.37	0.06

TRANSVERSE "DIAMETER" = 15.37 + 13.06 = 28.43

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-10.40	0.09
-8.47	0.26
-6.36	0.64
-4.25	1.23
-2.13	1.76
0.0	2.16
2.16	2.12
4.34	1.64
6.57	0.99
8.85	0.42
11.19	0.13
13.61	0.05

100 WATT PAR56 MFL SYMBOL #263

HEIGHT = 48 FEET

THETA = 15 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 12.86

PER CENT RED = 0.150

RADIAL "DIAMETER" = 9.52 + 6.54 = 16.06

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-8.66	0.09
-6.54	0.27
-4.40	0.74
-2.22	1.43
0.0	1.97
2.27	1.91
4.61	1.32
7.02	0.59
9.52	0.16
12.13	0.05

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.90	0.07
10.76	0.17
8.63	0.44
6.50	0.90
4.35	1.48
2.19	1.91
0.0	2.04
-2.23	1.79
-4.50	1.32
-6.82	0.78
-9.22	0.31
-11.69	0.10
-14.26	0.03

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
18.09	0.04
15.67	0.09
14.32	0.37
11.02	0.78
9.76	1.19

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 48 FEET MOUNTING ANGLE, THETA = 15 DEGREES

6.54	1.54
4.35	1.89
2.17	2.04
0.0	2.05
-2.17	1.95
-4.35	1.74
-6.54	1.37
-8.76	0.91
-11.02	0.56
-13.32	0.19
-15.67	0.05

TRANSVERSE "DIAMETER" = $15.67 + 13.32 = 28.98$

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-10.76	0.09
-8.63	0.26
-6.50	0.62
-4.35	1.18
-2.19	1.67
0.0	2.04
2.23	1.98
4.50	1.52
6.82	0.91
9.22	0.39
11.69	0.12
14.26	0.05

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 48 FEET

THEYA = 20 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 17.47

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.01	0.09
-6.83	0.26
-4.61	0.70
-2.34	1.33
0.0	1.82
2.41	1.74
4.91	1.19
7.52	0.53
10.24	0.14
13.11	0.04

RADIAL "DIAMETER" = 10.24 + 6.83 = 17.07

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
13.22	0.06
11.06	0.16
8.89	0.42
6.71	0.85
4.51	1.39
2.27	1.77
0.0	1.87
-2.32	1.64
-4.71	1.19
-7.17	0.70
-9.71	0.28
-12.35	0.09

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
18.59	0.04
16.11	0.08
13.69	0.34
11.32	0.72
9.01	1.10
6.72	1.42

300 WATT PAR56 MFL SYMROL #263 MOUNTING HEIGHT = 48 FEET MOUNTING ANGLE, THETA = 20 DEGREES

4.47
2.23
0.0
-2.23
-4.47
-6.72
-9.01
-11.32
-13.69
-16.11

1.74
1.88
1.89
1.79
1.60
1.26
0.74
0.52
0.17
0.05

TRANSVERSE "DIAMETER" = 16.11 + 13.69 = 29.79

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-11.06
-8.89
-6.71
-4.51
-2.27
0.0
2.32
4.71
7.17
9.71
12.35
15.12

0.08
0.24
0.58
1.10
1.55
1.87
1.81
1.37
0.82
0.34
0.11
0.04

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 48 FEET

THETA = 25 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 22.38

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.52	0.08
-7.25	0.24
-4.91	0.64
-2.50	1.21
0.0	1.63
2.60	1.54
5.33	1.04
8.20	0.45
11.23	0.12
14.45	0.03

RADIAL "DIAMETER" = 11.23 + 7.25 = 18.48

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
13.72	0.06
11.50	0.15
9.27	0.39
7.02	0.78
4.73	1.27
2.39	1.60
0.0	1.68
-2.46	1.45
-4.99	1.05
-7.62	0.61
-10.36	0.24
-13.22	0.07

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.70	0.08
14.19	0.30
11.74	0.65
9.34	0.98
6.97	1.28
4.63	1.56

300 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 48 FEET MOUNTING ANGLE, THETA = 25 DEGREES

2.31	1.69
0.0	1.70
-2.31	1.61
-4.63	1.44
-6.97	1.13
-9.34	0.67
-11.74	0.46
-14.19	0.16
-16.70	0.04

TRANSVERSE "DIAMETER" = 14.19 + 14.19 = 28.38

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.50	0.08
-9.27	0.23
-7.02	0.54
-4.73	1.01
-2.39	1.40
0.0	1.68
2.46	1.61
4.99	1.21
7.62	0.72
10.36	0.30
13.22	0.09

300 WATT PAR56 NFL SYMBOL #263

HEIGHT = 48 FEET
 THETA = 30 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 27.71
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.24	0.09
-7.83	0.22
-5.33	0.58
-2.73	1.07
0.0	1.42
2.87	1.32
5.90	0.98
9.12	0.39
12.56	0.10
16.27	0.03

RADIAL "DIAMETER" = 12.56 + 7.83 = 20.39

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.42	0.06
12.12	0.14
9.79	0.35
7.43	0.70
5.02	1.12
2.55	1.41
0.0	1.47
-2.63	1.26
-5.36	0.90
-8.21	0.52
-11.19	0.20
-14.34	0.06

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.48	0.07
14.85	0.26
12.29	0.56
9.77	0.85
7.30	1.11
4.85	1.36

MOUNTING HEIGHT = 48 FEET

MOUNTING ANGLE, THETA = 30 DEGREES

300 WATT PAR56 MFL SYMNOL #263

2.42
0.0
-2.42
-4.85
-7.30
-9.77
-12.29
-14.85
-17.48

1.47
1.48
1.40
1.25
0.98
0.58
0.40
0.14
0.04

TRANSVERSE "DIAMETER" = 14.85 + 14.85 = 29.70

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-12.12
-9.79
-7.43
-5.02
-2.55
0.0
2.63
5.36
8.21
11.19
14.34

0.07
0.20
0.48
0.89
1.23
1.47
1.39
1.04
0.61
0.25
0.08

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 48 FEET
 THETA = 35 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 33.61
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-11.23	0.07
-8.62	0.19
-5.90	0.50
-3.03	0.92
0.00	1.20
3.22	1.10
6.67	0.72
10.37	0.30
14.39	0.07

RADIAL "DIAMETER" = 10.37 + 8.62 = 19.00

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
15.35	0.05
12.94	0.12
10.48	0.31
7.97	0.60
5.40	0.97
2.75	1.20
0.00	1.24
-2.85	1.06
-5.84	0.75
-8.96	0.43
-12.26	0.17
-15.76	0.05

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
19.48	0.06
15.70	0.22
12.99	0.48
10.23	0.73
7.71	0.94
5.13	1.15
2.56	1.24

MOUNTING HEIGHT = 48 FEET MOUNTING ANGLE, THETA = 35 DEGREES

300 WATT PAR56 MFL SYMBOL #263

0.0	1.25
-2.56	1.19
-5.13	1.06
-7.71	0.83
-10.33	0.49
-12.99	0.34
-15.70	0.11
-19.48	0.03

TRANSVERSE "DIAMETER" = 15.70 + 15.70 = 31.40

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-12.94	0.06
-10.48	0.18
-7.97	0.42
-5.40	0.77
-2.75	1.05
0.0	1.24
2.85	1.17
5.84	0.86
8.96	0.50
12.26	0.20
15.76	0.05

300 WATT PAR56 MEL SYMBOL #263

HEIGHT = 48 FEET

THETA = 40 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 40.28

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-12.56	0.06
-9.70	0.17
-6.67	0.42
-3.45	0.77
0.0	0.98
3.71	0.88
7.72	0.56
12.11	0.23
16.93	0.06

RADIAL "DIAMETER" = $12.11 + 9.70 = 21.80$

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.01	0.10
11.38	0.26
8.68	0.51
5.89	0.80
3.00	0.99
0.0	1.02
-3.14	0.86
-6.44	0.60
-9.93	0.34
-13.63	0.13
-17.58	0.04

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
19.76	0.05
16.79	0.18
13.89	0.39
11.05	0.59
8.25	0.77
5.48	0.94
2.74	1.02
0.0	1.02

MOUNTING HEIGHT = 48 FEET MOUNTING ANGLE, THETA = 40 DEGREES

300 WATT PAR56 NFL SYMBOL #263

-2.74 0.97
 -5.48 0.87
 -8.25 0.68
 -11.05 0.40
 -13.89 0.28
 -16.79 0.09

TRANSVERSE "DIAMETER" = 16.79 + 13.89 = 30.68

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-14.41 0.05
 -11.38 0.15
 -8.68 0.35
 -5.83 0.64
 -3.00 0.97
 0.0 1.02
 3.14 0.95
 6.44 0.69
 9.93 0.40
 13.63 0.15
 17.54 0.05

LAMP - 300 WATT PAR56 MFL

FIXTURE - SYMBOL #263

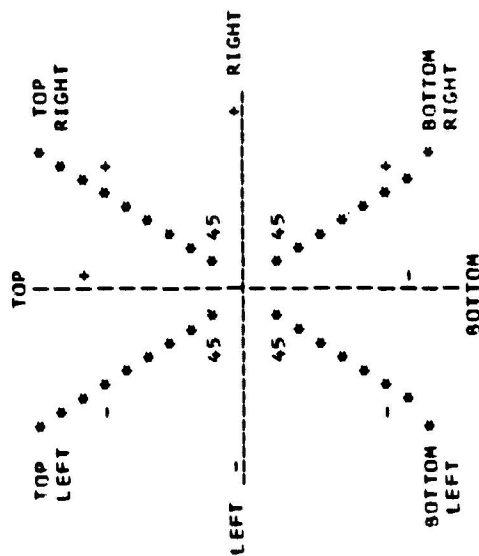
TRANSMISSION FACTOR - 0.150
(PER CFMT REQ)



MOUNTING POLE

		VERTICAL AXIS										HORIZONTAL AXIS									
		BOTTOM TO TOP					TOP LEFT TO BOTTOM RIGHT					LEFT TO RIGHT					BOTTOM LEFT TO TOP RIGHT				
		0.2	0.5	0.5	0.2	0.2	0.2	0.5	0.5	0.2	0.2	0.2	0.5	0.5	0.2	0.2	0.2	0.5	0.5	0.2	0.2
M	D	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	16.0	45	1	-13.9	-5.8	6.9	9.1	-8.3	-6.6	7.9	9.6	-10.6	-8.2	9.4	10.6	-8.7	-7.0	6.6	10.1		
20	14.0	35	1	-13.1	-5.7	7.8	9.8	-8.1	-6.6	8.4	10.3	-11.4	-8.9	10.1	11.4	-9.3	-7.4	8.1	9.8		
20	16.8	40	1	-14.1	-6.4	7.1	9.3	-9.1	-7.3	9.0	10.0	-10.8	-9.5	10.8	12.2	-9.0	-6.9	7.3	11.0		
20	20.0	45	1	-9.6	-7.3	9.6	11.4	-10.4	-5.4	8.7	10.9	-11.7	-10.3	10.3	13.2	-9.8	-7.6	8.3	10.4		
24	8.7	20	1	-7.7	-5.6	6.6	8.1	-9.0	-6.2	8.8	9.9	-11.9	-10.6	10.6	11.9	-8.8	-6.6	7.6	9.0		
24	11.2	25	1	-8.0	-5.9	7.2	8.9	-8.1	-6.6	8.0	10.2	-12.3	-9.6	11.0	12.3	-9.1	-6.9	8.1	9.7		
24	13.9	30	1	-8.5	-6.3	6.3	8.1	-8.8	-7.2	8.3	10.6	-12.9	-10.1	11.5	12.9	-9.5	-7.2	7.2	10.6		
24	16.8	35	1	-8.1	-6.9	7.2	9.4	-9.7	-6.1	8.9	11.2	-12.1	-10.7	10.7	13.7	-10.0	-7.7	7.9	9.7		
24	20.1	40	1	-8.9	-6.3	6.5	11.1	-8.8	-6.8	9.6	12.0	-13.0	-9.9	11.4	13.0	-9.6	-8.3	7.8	10.9		
24	24.0	45	1	-8.7	-7.2	7.3	10.3	-10.0	-5.6	9.1	11.8	-14.1	-10.7	10.7	14.1	-10.5	-7.7	7.7	12.4		
28	0.0	0	1	-7.5	-6.2	6.2	7.5	-8.8	-6.2	8.8	10.2	-13.1	-10.2	11.6	13.1	-8.8	-7.5	7.5	8.8		
28	2.4	5	1	-7.4	-6.1	6.4	7.7	-9.1	-6.3	8.7	11.4	-13.1	-10.2	11.6	13.1	-10.0	-7.4	7.7	9.1		
28	4.9	10	1	-7.4	-6.2	6.7	8.1	-7.9	-6.5	8.7	11.3	-13.3	-10.3	11.8	13.3	-10.0	-7.4	7.9	9.4		
28	7.5	15	1	-7.5	-6.3	7.1	8.7	-8.3	-6.8	8.8	11.3	-13.5	-10.6	12.0	13.5	-10.1	-7.5	8.3	9.9		
28	10.2	20	1	-7.7	-6.5	7.6	9.4	-8.8	-7.2	9.0	11.5	-12.3	-10.8	10.8	13.9	-10.2	-7.7	7.2	10.5		
28	13.1	25	1	-8.1	-5.6	6.5	8.4	-9.5	-7.7	9.3	11.9	-12.8	-11.2	11.2	14.4	-9.3	-8.0	7.7	11.3		

28	16.2	30	-8.7	-6.0	7.3	9.5	-10.3	-6.5	9.7	11.1	-13.4	-10.2	11.8	15.1	-9.7	-8.4	8.4	10.3
28	19.6	35	-8.0	-6.5	8.4	11.0	-9.2	-7.2	10.3	11.7	-14.2	-10.8	10.8	14.2	-10.3	-7.5	7.2	11.4
32	0.0	0	-7.1	-5.6	7.1	8.6	-8.6	-7.1	8.6	11.6	-13.3	-11.6	11.6	14.9	-10.1	-7.1	8.6	10.1
32	2.8	5	-7.0	-5.6	7.3	8.8	-8.8	-7.2	10.0	11.5	-13.3	-11.7	11.7	15.0	-10.0	-8.5	8.8	10.3
32	5.6	10	-7.0	-5.6	6.0	9.3	-9.1	-7.5	9.9	11.4	-13.5	-11.8	11.8	15.2	-9.9	-8.5	7.5	10.7
32	8.6	15	-7.2	-5.8	6.3	8.1	-9.5	-7.8	10.0	11.5	-13.7	-12.1	12.1	15.4	-10.0	-8.6	7.8	11.3
32	11.6	20	-7.4	-6.0	6.8	8.7	-10.1	-6.5	10.3	11.7	-14.1	-10.7	12.4	15.9	-10.3	-7.4	8.2	10.1
32	14.9	25	-7.8	-6.3	7.5	9.6	-10.8	-6.9	9.1	12.1	-14.6	-11.1	12.9	14.6	-10.6	-7.7	8.8	10.8
32	18.5	30	-8.4	-6.8	6.1	10.8	-9.6	-7.5	9.6	12.6	-15.3	-11.7	11.7	15.3	-11.1	-8.1	7.5	11.8
36	0.0	0	-8.0	-6.3	6.3	9.6	-9.6	-8.0	9.6	13.1	-14.9	-11.4	13.1	14.9	-11.4	-8.0	8.0	11.4
36	3.1	5	-7.9	-6.3	6.5	8.2	-9.9	-6.5	9.5	12.9	-15.0	-11.4	13.2	15.0	-11.2	-7.9	8.1	11.6
36	6.3	10	-7.9	-6.3	6.8	8.6	-10.2	-6.6	9.6	12.8	-15.1	-11.5	13.3	15.1	-11.2	-7.9	8.4	10.2
36	9.6	15	-8.1	-6.5	7.1	9.1	-10.7	-6.9	9.7	12.9	-15.4	-11.8	11.8	15.4	-11.3	-8.1	8.8	10.7
36	13.1	20	-8.4	-6.8	7.7	9.8	-9.3	-7.3	9.9	13.2	-15.9	-12.1	12.1	15.9	-11.5	-8.3	9.3	11.3
40	0.0	0	-8.9	-7.1	7.1	8.9	-10.7	-7.1	10.7	12.6	-16.6	-12.6	12.6	16.6	-10.7	-7.1	8.9	10.7
40	3.5	5	-8.8	-7.0	7.2	9.1	-11.0	-7.2	10.6	12.4	-16.6	-12.7	12.7	16.6	-10.6	-7.0	9.0	11.0
40	7.1	10	-8.8	-7.1	7.5	9.5	-11.3	-7.4	10.6	12.4	-16.8	-12.8	12.8	16.8	-10.6	-7.1	9.3	11.3



■
MOUNTING POLE

300 WATT PAR56 WFL SYMBOL #263
ABRIDGED ILLUMINATION PROFILE

300 WATT PAR56 MFL SYMBOL #263

HEIGHT = 16 FEET
 THETA = 45 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 16.00
 PER CENT REQ = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-14.60	0.10
-13.89	0.16
-13.18	0.25
-12.45	0.30
-11.71	0.29
-10.96	0.25
-10.18	0.24
-9.37	0.25
-8.54	0.29
-7.67	0.29
-6.76	0.38
-5.81	0.51
-4.80	1.33
-3.72	2.18
-2.57	2.57
-1.34	2.47
0.0	2.24
1.46	1.87
3.07	1.51
4.85	1.14
6.85	0.61
9.11	0.25
11.71	0.08

RADIAL "DIAMETER" = 9.11 + 13.89 = 23.01

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
10.46	0.17
9.60	0.20
8.73	0.29
7.86	0.48
6.97	0.82
6.06	1.40
5.14	1.99
4.18	2.38
3.20	2.48
2.18	2.46
1.11	2.35
0.0	2.15

MOUNTING HEIGHT = 16 FEET MOUNTING ANGLE, THETA = 45 DEGREES

300 WATT PAR56 WFL SYMBOL #263

-1.17	1.91
-2.41	1.64
-3.72	1.31
-5.13	0.85
-6.64	0.46
-8.28	0.20
-10.07	0.08

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE ILLUMINATION

11.78	0.11
10.55	0.24
9.37	0.47
8.24	0.80
7.13	1.11
6.06	1.46
5.02	1.66
3.99	1.84
2.98	1.97
1.98	2.07
0.99	2.17
0.0	2.21
-0.99	2.18
-1.98	2.12
-2.98	2.01
-3.99	1.83
-5.02	1.63
-6.06	1.35
-7.13	0.97
-8.24	0.63
-9.37	0.34
-10.55	0.15
-11.78	0.07

TRANSVERSE "DIAMETER" = 10.55 + 10.55 = 21.10

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-9.60	0.19
-8.73	0.20
-7.86	0.26
-6.97	0.44
-6.06	0.77
-5.14	1.28
-4.18	1.67
-3.20	2.29
-2.18	2.40
-1.11	2.38
0.0	2.25

MOUNTING HEIGHT = 16 FEET

MOUNTING ANGLE, THETA = 45 DEGREES

300 WATT PAR56 WFL SYMBOL #263

1.17	1.98
2.41	1.82
3.72	1.45
5.13	1.12
6.64	0.66
8.28	0.33
10.07	0.13
12.04	0.05

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 20 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 14.00

THETA = 35 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-14.00	0.17
-13.13	0.21
-12.25	0.20
-11.37	0.18
-10.48	0.17
-9.57	0.19
-8.65	0.22
-7.70	0.23
-6.72	0.31
-5.72	0.43
-4.68	1.16
-3.59	1.95
-2.46	2.37
-1.26	2.36
0.0	2.23
1.34	1.94
2.78	1.63
4.32	1.30
6.00	0.74
7.82	0.31
9.83	0.11
12.06	0.02

RADIAL "DIAMETER" = 9.83 + 13.13 = 22.96

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
11.30	0.14
10.32	0.18
9.35	0.25
8.37	0.43
7.39	0.73
6.40	1.27
5.39	1.83
4.37	2.22
3.32	2.35
2.25	2.37
1.14	2.30
0.0	2.14
-1.19	1.94

300 WATT PAR56 WFL SYMROL #263 MOUNTING HEIGHT = 20 FEET MOUNTING ANGLE, THETA = 35 DEGREES

-2.43 1.70
-3.73 1.38
-5.11 0.92
-6.57 0.50
-8.12 0.23
-9.79 0.09

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE ILLUMINATION

12.71 0.11
11.39 0.24
10.11 0.46
8.89 0.79
7.70 1.11
6.54 1.45
5.41 1.65
4.31 1.83
3.21 1.96
2.14 2.06
1.07 2.16
0.0 2.20
-1.07 2.17
-2.14 2.11
-3.21 2.00
-4.31 1.82
-5.41 1.62
-6.54 1.35
-7.70 0.96
-8.89 0.63
-10.11 0.34
-11.39 0.15
-12.71 0.07

TRANSVERSE "DIAMETER" = 11.39 + 11.39 = 22.77

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-10.32 0.16
-9.35 0.17
-8.37 0.23
-7.39 0.39
-6.40 0.70
-5.39 1.17
-4.37 1.56
-3.32 2.17
-2.25 2.31
-1.14 2.33
0.0 2.24
1.19 2.01

MOUNTING ANGLE, THETA = 35 DEGREES

MOUNTING HEIGHT = 20 FEET

300 WATT PAR56 WFL	SYMBOL #263	
2.43	1.88	
3.73	1.53	
5.11	1.20	
6.57	0.73	
8.12	0.37	
9.79	0.16	
11.59	0.06	

300 WATT PAR56 WFL SYMROL #263

HEIGHT = 20 FEET

THETA = 40 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 16.78

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-15.03	0.16
-14.15	0.20
-13.26	0.20
-12.35	0.17
-11.42	0.16
-10.48	0.18
-9.50	0.20
-8.50	0.21
-7.46	0.28
-6.37	0.38
-5.23	1.01
-4.04	1.67
-2.78	2.01
-1.44	1.97
0.00	1.82
1.54	1.56
3.22	1.28
5.04	1.00
7.05	0.55
9.28	0.23
11.78	0.08

RADIAL "DIAMETER" = 9.28 + 14.15 = 23.43

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
11.04	0.15
10.02	0.22
9.00	0.37
7.96	0.63
6.91	1.09
5.84	1.56
4.74	1.88
3.62	1.97
2.45	1.97
1.25	1.90
0.00	1.75
-1.31	1.57
-2.68	1.36
-4.14	1.10

MOUNTING HEIGHT = 20 FEET

MOUNTING ANGLE, THETA = 40 DEGREES

300 WATT PAR54 WFL SYMBOL #263

-5.68 0.72
 -7.33 0.39
 -9.10 0.18
 -11.01 0.07

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
13.59	0.09
12.17	0.20
10.81	0.38
9.50	0.65
8.23	0.91
7.00	1.19
5.79	1.35
4.60	1.50
3.44	1.60
2.28	1.69
1.14	1.76
0.0	1.80
-1.14	1.78
-2.28	1.73
-3.44	1.63
-4.60	1.49
-5.79	1.32
-7.00	1.10
-8.23	0.79
-9.50	0.57
-10.81	0.28
-12.17	0.12

TRANSVERSE "DIAMETER" = 12.17 + 10.81 = 22.99

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-10.02	0.15
-9.00	0.20
-7.96	0.34
-6.91	0.60
-5.84	1.00
-4.74	1.32
-3.62	1.97
-2.45	1.92
-1.25	1.92
0.0	1.83
1.31	1.63
2.68	1.51
4.14	1.22
5.68	0.95
7.33	0.57

300 WATT PAR56 WFL SYMBOL #263 MOUNTING HEIGHT = 20 FEET MOUNTING ANGLE, THETA = 40 DEGREES

9.10
11.01
13.10
0.28
0.12
0.04

300 WATT PAR56 WFL SYMROL #263

HEIGHT = 20 FEET

THETA = 45 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 20.00

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.67	0.18
-9.59	0.19
-8.45	0.24
-7.26	0.32
-6.00	0.85
-4.65	1.39
-3.22	1.64
-1.67	1.58
0.0	1.43
1.83	1.20
3.84	0.97
6.06	0.73
8.56	0.39
11.39	0.16
14.64	0.05

RADIAL "DIAMETER" = 11.39 + 9.59 = 20.98

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.00	0.13
10.92	0.19
9.82	0.31
8.71	0.52
7.58	0.90
6.42	1.27
5.23	1.52
4.00	1.59
2.72	1.58
1.39	1.50
0.0	1.37
-1.46	1.22
-3.01	1.05
-4.65	0.84
-6.41	0.55
-8.30	0.29
-10.35	0.13
-12.59	0.05

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
14.72	0.07

MOUNTING HEIGHT = 20 FEET

MOUNTING ANGLE, THETA = 45 DEGREES

300 WATT PAR56 WFL SYMBOL #263

13.19	0.15
11.72	0.30
10.29	0.51
8.92	0.71
7.58	0.93
6.27	1.06
4.99	1.18
3.72	1.26
2.47	1.33
1.23	1.39
0.0	1.42
-1.23	1.40
-2.47	1.36
-3.72	1.28
-4.99	1.17
-6.27	1.04
-7.58	0.87
-8.92	0.62
-10.29	0.41
-11.72	0.22
-13.19	0.10

TRANSVERSE "DIAMETER" = 13.19 + 11.72 = 24.90

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-10.92	0.13
-9.82	0.17
-8.71	0.28
-7.58	0.49
-6.42	0.82
-5.23	1.07
-4.00	1.47
-2.72	1.54
-1.39	1.52
0.0	1.44
1.46	1.27
3.01	1.16
4.65	0.93
6.41	0.72
8.30	0.42
10.35	0.21
12.59	0.09

300 WATT PAR56 WFL SYMROL #263

HEIGHT = 24 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 8.74

THETA = 20 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-8.74	0.17
-7.69	0.19
-6.64	0.26
-5.58	0.37
-4.50	1.03
-3.41	1.80
-2.30	2.29
-1.17	2.37
0.0	2.34
1.21	2.13
2.46	1.88
3.76	1.57
5.12	0.94
6.55	0.42
8.07	0.15
9.68	0.04

RADIAL MOIAMETER* = 8.07 + 7.69 = 15.76

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
11.00	0.15
9.88	0.21
8.78	0.37
7.69	0.65
6.61	1.15
5.53	1.70
4.45	2.11
3.36	2.29
2.25	2.36
1.14	2.35
0.0	2.24
-1.16	2.09
-2.35	1.87
-3.58	1.57
-4.85	1.07
-6.18	0.60
-7.56	0.29
-9.01	0.11
-10.54	0.04

300 WATT PAR56 WFL SYMROL #263 MOUNTING HEIGHT = 24 FEET MOUNTING ANGLE, THETA = 20 DEGREES

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
13.30	0.11
11.91	0.25
10.58	0.49
9.30	0.83
8.05	1.16
6.84	1.52
5.66	1.73
4.50	1.92
3.36	2.05
2.23	2.16
1.12	2.26
0.0	2.31
-1.12	2.28
-2.23	2.22
-3.36	2.09
-4.50	1.91
-5.66	1.70
-6.84	1.41
-8.05	1.01
-9.30	0.66
-10.58	0.35
-11.91	0.16
-13.30	0.07

TRANSVERSE "DIAMETER" = 11.91 + 11.91 = 23.82

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-9.88	0.14
-8.78	0.20
-7.69	0.35
-6.61	0.64
-5.53	1.09
-4.45	1.48
-3.36	2.12
-2.25	2.31
-1.14	2.38
0.0	2.35
1.16	2.16
2.35	2.07
3.58	1.74
4.85	1.41
6.18	0.88
7.56	0.46
9.01	0.20
10.54	0.08

300 WATT PAR56 WFL SYMROL #263

HEIGHT = 24 FEET

THETA = 25 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 11.19

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.09	0.17
-8.03	0.18
-6.96	0.25
-5.87	0.35
-4.76	0.97
-3.62	1.68
-2.46	2.11
-1.25	2.16
0.0	2.10
1.30	1.88
2.67	1.64
4.10	1.35
5.61	0.80
7.22	0.35
8.95	0.12
10.80	0.03

RADIAL "DIAMETER" = 8.95 + 8.03 = 16.98

PORTION RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
11.29	0.14
10.17	0.21
9.07	0.35
7.96	0.62
6.86	1.08
5.75	1.59
4.64	1.96
3.51	2.11
2.36	2.16
1.20	2.13
0.0	2.01
-1.23	1.85
-2.50	1.65
-3.81	1.37
-5.18	0.93
-6.61	0.52
-8.12	0.24
-9.71	0.10

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
13.79	0.10

300 WATT PAR54 WFL	SYMBOL #263	MOUNTING HEIGHT = 24 FEET	MOUNTING ANGLE, THETA = 25 DEGREES
12.35	0.23		
10.97	0.44		
9.64	0.75		
8.35	1.04		
7.10	1.36		
5.87	1.56		
4.67	1.72		
3.49	1.84		
2.32	1.94		
1.16	2.03		
0.0	2.07		
-1.16	2.04		
-2.32	1.99		
-3.49	1.88		
-4.67	1.71		
-5.87	1.52		
-7.10	1.27		
-8.35	0.91		
-9.64	0.59		
-10.97	0.32		
-12.35	0.14		
-13.79	0.06		
		TRANSVERSE "FOOTAMETER" = 12.35 + 12.35 =	24.70

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-10.17	0.14
-9.07	0.19
-7.96	0.33
-6.86	0.60
-5.75	1.02
-4.64	1.37
-3.51	1.95
-2.36	2.10
-1.20	2.15
0.0	2.11
1.23	1.92
2.50	1.83
3.81	1.52
5.18	1.22
6.61	0.75
8.12	0.39
9.71	0.17
11.40	0.06

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 24 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 13.86

THETA = 30 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.62	0.16
-8.54	0.17
-7.43	0.23
-6.29	0.33
-5.12	0.89
-3.92	1.53
-2.67	1.89
-1.36	1.91
0.0	1.83
1.43	1.62
2.95	1.39
4.56	1.12
6.28	0.65
8.14	0.28
10.14	0.10

RADIAL "DIAMETER" = $8.14 + 8.54 = 16.67$

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
11.74	0.13
10.61	0.19
9.48	0.33
8.35	0.57
7.21	0.99
6.06	1.44
4.90	1.76
3.72	1.88
2.51	1.91
1.27	1.87
0.0	1.75
-1.32	1.60
-2.68	1.42
-4.10	1.17
-5.60	0.78
-7.17	0.43
-8.83	0.20
-10.60	0.08

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
14.43	0.09

MOUNTING HEIGHT = 24 FEET

MOUNTING ANGLE, THETA = 30 DEGREES

300 WATT PAR56 WFL SYMBOL #263

12.92	0.20
11.48	0.38
10.09	0.65
8.74	0.91
7.43	1.19
6.14	1.36
4.89	1.50
3.65	1.61
2.42	1.69
1.21	1.77
0.0	1.81
-1.21	1.78
-2.42	1.73
-3.65	1.64
-4.89	1.49
-6.14	1.33
-7.43	1.11
-8.74	0.79
-10.09	0.52
-11.48	0.28
-12.92	0.12
-14.43	0.05

TRANSVERSE "DIAMETER" = 12.92 + 12.92 = 25.85

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-10.61	0.13
-9.48	0.18
-8.35	0.31
-7.21	0.55
-6.06	0.93
-4.90	1.24
-3.72	1.74
-2.51	1.87
-1.27	1.89
0.0	1.84
1.32	1.66
2.68	1.57
4.10	1.29
5.60	1.03
7.17	0.63
8.83	0.32
10.60	0.14
12.50	0.05

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 24 FEET

THETA = 35 DEGREES

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 16.80

PER CENT RED = 0.150

DISTANCE ILLUMINATION

-9.24	0.16
-8.07	0.22
-6.86	0.30
-5.61	0.80
-4.31	1.35
-2.95	1.65
-1.52	1.64
0.0	1.55
1.61	1.35
3.33	1.13
5.19	0.90
7.20	0.51
9.39	0.22
11.80	0.07

RADIAL "DIAMETER" = 9.39 + 8.07 = 17.46

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

12.38	0.12
11.22	0.18
10.04	0.30
8.87	0.51
7.68	0.88
6.47	1.27
5.24	1.54
3.99	1.63
2.70	1.65
1.37	1.60
0.0	1.48
-1.43	1.35
-2.92	1.18
-4.48	0.96
-6.13	0.64
-7.88	0.35
-9.75	0.16
-11.75	0.06

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE ILLUMINATION

15.25	0.07
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MOUNTING HEIGHT = 24 FEET

MOUNTING ANGLE, THETA = 35 DEGREES

300 WATT PAR56 WFL SYMROL #263

13.66	0.17
12.14	0.32
10.66	0.55
9.24	0.77
7.85	1.01
6.50	1.15
5.17	1.27
3.86	1.36
2.56	1.43
1.28	1.50
0.0	1.53
-1.28	1.51
-2.56	1.47
-3.86	1.39
-5.17	1.26
-6.50	1.12
-7.85	0.94
-9.24	0.67
-10.66	0.44
-12.14	0.23
-13.66	0.11

TRANSVERSE "DIAMETER" = 13.66 + 12.14 = 25.80

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.22	0.12
-10.04	0.16
-8.87	0.27
-7.68	0.49
-6.47	0.82
-5.24	1.08
-3.99	1.51
-2.70	1.61
-1.37	1.62
0.0	1.56
1.43	1.40
2.92	1.30
4.48	1.06
6.13	0.84
7.88	0.50
9.75	0.26
11.75	0.11

300 WATT PAR56 WFL SYMBOL #263

WEIGHT = 24 FEET

TMETA = 40 DEGREES

OISTANCE FROM BASE OF POLE TO CENTER SPOT = 20.14

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE ILLUMINATION

-10.20	0.15
-8.95	0.19
-7.64	0.26
-6.28	0.70
-4.85	1.16
-3.33	1.40
-1.72	1.37
0.0	1.27
1.85	1.08
3.86	0.89
6.05	0.69
8.46	0.38
11.14	0.16
14.14	0.05

RADIAL "DIAMETER" = 11.14 + 8.95 = 20.09

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

13.25	0.11
12.03	0.15
10.80	0.26
9.55	0.44
8.29	0.75
7.01	1.08
5.69	1.30
4.34	1.37
2.95	1.37
1.50	1.32
0.0	1.21
-1.57	1.09
-3.22	0.95
-4.96	0.76
-6.82	0.50
-8.79	0.27
-10.92	0.12

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE ILLUMINATION

14.61	0.14
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MOUNTING HEIGHT = 24 FEET

MOUNTING ANGLE, THETA = 40 DEGREES

300 WATT PAR56 WFL SYMBOL #263

12.98	0.26
11.40	0.45
9.88	0.63
8.39	0.82
6.95	0.94
5.52	1.04
4.12	1.11
2.74	1.17
1.37	1.23
0.0	1.25
-1.37	1.23
-2.74	1.20
-4.12	1.13
-5.52	1.03
-6.95	0.92
-8.39	0.76
-9.88	0.55
-11.40	0.36
-12.98	0.19
-14.61	0.09

TRANSVERSE "DIAMETER" = 12.98 + 12.98 = 25.95

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-10.30	0.14
-9.55	0.24
-8.29	0.42
-7.01	0.69
-5.69	0.91
-4.34	1.26
-2.95	1.34
-1.50	1.33
0.0	1.27
1.57	1.13
3.22	1.05
4.96	0.85
6.82	0.66
8.79	0.39
10.92	0.20
13.22	0.08

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 24 FEET

THETA = 45 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 24.00

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.14	0.17
-9.71	0.22
-7.20	0.59
-5.58	0.97
-3.86	1.14
-2.01	1.10
0.0	1.00
2.19	0.83
4.60	0.67
7.20	0.51
10.28	0.27
13.67	0.11

RADIAL "DIAMETER" = 10.28 + 8.71 = 18.99

RIGHT TO LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
13.10	0.13
11.79	0.22
10.45	0.36
9.09	0.62
7.70	0.88
6.27	1.06
4.80	1.10
3.26	1.09
1.67	1.04
0.0	0.95
-1.76	0.85
-3.61	0.73
-5.58	0.58
-7.69	0.38
-9.96	0.20
-12.42	0.09

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
15.83	0.11

300 WATT PAR56 WFL SYMBOL #263 MOUNTING HEIGHT = 24 FEET MOUNTING ANGLE, THETA = 45 DEGREES

14.06	0.21
12.35	0.35
10.70	0.49
9.09	0.65
7.52	0.74
5.98	0.82
4.47	0.87
2.97	0.92
1.48	0.96
0.0	0.98
-1.48	0.97
-2.97	0.94
-4.47	0.89
-5.98	0.81
-7.52	0.72
-9.09	0.60
-10.70	0.43
-12.35	0.28
-14.06	0.15
-15.83	0.07

TRANSVERSE "DIAMETER" = 14.06 + 14.06 = 28.12

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.79	0.12
-10.45	0.20
-9.09	0.34
-7.70	0.57
-6.27	0.74
-4.80	1.02
-3.26	1.07
-1.67	1.06
0.0	1.00
1.76	0.88
3.61	0.81
5.58	0.65
7.69	0.50
9.96	0.29
12.42	0.14
15.11	0.06

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 28 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 0.0

THETA = 0 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-8.83	0.12
-7.50	0.17
-6.21	0.26
-4.94	0.76
-3.69	1.39
-2.45	1.84
-1.22	2.00
0.0	2.07
1.22	1.98
2.45	1.83
3.69	1.61
4.94	1.02
6.21	0.48
7.50	0.18
8.83	0.05

RADIAL "DIAMETER" = 7.50 + 7.50 = 15.01

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
11.60	0.14
10.19	0.25
8.83	0.46
7.50	0.84
6.21	1.28
4.94	1.64
3.69	1.84
2.45	1.96
1.22	2.01
0.0	1.98
-1.22	1.91
-2.45	1.77
-3.69	1.54
-4.94	1.09
-6.21	0.63
-7.50	0.31
-8.83	0.13
-10.19	0.05

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
14.58	0.10

100 WATT PAR56 MFL SYMBOL #263 MOUNTING HEIGHT = 28 FEET MOUNTING ANGLE, THETA = 0 DEGREES

13.06	0.22
11.60	0.43
10.19	0.74
8.83	1.03
7.50	1.35
6.21	1.53
4.94	1.70
3.69	1.82
2.45	1.91
1.22	2.00
0.0	2.04
-1.22	2.01
-2.45	1.96
-3.69	1.85
-4.94	1.69
-6.21	1.50
-7.50	1.25
-8.83	0.89
-10.19	0.59
-11.60	0.31
-13.06	0.14
-14.58	0.06

TRANSVERSE "DIAMETER" = 13.06 + 13.06 = 26.11

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-10.19	0.14
-8.83	0.25
-7.50	0.46
-6.21	0.82
-4.94	1.15
-3.69	1.70
-2.45	1.91
-1.22	2.04
0.0	2.08
1.22	1.98
2.45	1.96
3.69	1.70
4.94	1.43
6.21	0.92
7.50	0.50
8.83	0.23
10.19	0.09

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 24 FEET
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 2.45
 THETA = 5 DEGREES
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-8.66	0.13
-7.39	0.18
-6.14	0.27
-4.90	0.78
-3.67	1.42
-2.45	1.87
-1.23	2.00
0.0	2.04
1.24	1.93
2.49	1.77
3.76	1.54
5.05	0.96
6.38	0.45
7.74	0.17
9.15	0.04

RADIAL "DIAMETER" = 7.74 + 7.39 = 15.13

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.76	0.10
11.37	0.15
10.02	0.27
8.71	0.48
7.42	0.87
6.16	1.32
4.91	1.68
3.68	1.86
2.45	1.97
1.23	2.01
0.0	1.96
-1.23	1.87
-2.48	1.72
-3.74	1.48
-5.02	1.04
-6.33	0.60
-7.67	0.29
-9.06	0.12
-10.49	0.05

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
14.63	0.10

MOUNTING HEIGHT = 28 FEET

MOUNTING ANGLE, THETA = 5 DEGREES

300 WATT PAR54 WFL SYMBOL #263

13.11	0.22
11.64	0.43
10.23	0.73
8.86	1.02
7.53	1.33
6.23	1.52
4.96	1.68
3.70	1.80
2.46	1.89
1.23	1.98
0.0	2.02
-1.23	1.99
-2.46	1.94
-3.70	1.83
-4.96	1.67
-6.23	1.49
-7.53	1.24
-8.86	0.88
-10.23	0.58
-11.64	0.31
-13.11	0.14
-14.63	0.06

TRANSVERSE "DIAMETER" = 13.11 + 13.11 = 26.21

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-11.37	0.10
-10.07	0.14
-8.71	0.26
-7.42	0.48
-6.16	0.85
-4.91	1.18
-3.68	1.72
-2.45	1.92
-1.23	2.03
0.0	2.06
1.23	1.94
2.48	1.91
3.74	1.64
5.02	1.37
6.33	0.87
7.67	0.47
9.06	0.21
10.49	0.08

300 WATT PARSA WFL SYMBOL #263

WEIGHT = 29 FEET
 THETA = 10 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 4.94
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-8.62	0.13
-7.39	0.14
-6.16	0.27
-4.94	0.79
-3.71	1.42
-2.49	1.84
-1.25	1.96
0.0	1.98
1.27	1.85
2.57	1.67
3.89	1.43
5.25	0.88
6.66	0.41
8.12	0.15
9.64	0.04

RADIAL "DIAMETER" = 8.12 + 7.39 = 15.51

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.63	0.10
11.29	0.16
9.98	0.28
8.69	0.40
7.41	0.88
6.18	1.33
4.94	1.68
3.71	1.85
2.48	1.93
1.24	1.96
0.0	1.89
-1.26	1.79
-2.53	1.64
-3.83	1.40
-5.16	0.97
-6.53	0.56
-7.94	0.27
-9.40	0.11

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
14.80	0.09

300 WATT PAR56 WFL SYMBOL #263 MOUNTING HEIGHT = 28 FEET MOUNTING ANGLE, THETA = 10 DEGREES

13.26	0.21
11.78	0.41
10.35	0.70
8.96	0.98
7.62	1.29
6.30	1.47
5.01	1.62
3.74	1.74
2.49	1.83
1.74	1.91
0.0	1.95
-1.24	1.92
-2.49	1.87
-3.74	1.77
-5.01	1.61
-6.30	1.44
-7.62	1.19
-8.96	0.85
-10.35	0.56
-11.78	0.30
-13.26	0.13
-14.80	0.06

TRANSVERSE "DIAMETER" = 13.26 + 13.26 = 26.52

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.29	0.11
-9.98	0.15
-8.69	0.26
-7.43	0.49
-6.18	0.85
-4.94	1.17
-3.71	1.70
-2.48	1.89
-1.24	1.98
0.0	1.99
1.26	1.86
2.53	1.81
3.83	1.55
5.16	1.28
6.53	0.81
7.94	0.43
9.40	0.19
10.97	0.07

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 28 FEET DISTANCE FROM BASE OF POLE TO CENTER SPOT = 7.50

THETA = 15 DEGREES PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-8.73	0.14
-7.50	0.19
-6.28	0.27
-5.05	0.78
-3.82	1.39
-2.57	1.78
-1.30	1.87
0.0	1.86
1.33	1.72
2.69	1.54
4.10	1.30
5.55	0.79
7.07	0.36
8.66	0.13
10.34	0.03

RADIAL "DIAMETER" = $8.66 + 7.50 = 16.17$

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.65	0.11
11.34	0.16
10.05	0.28
8.78	0.49
7.53	0.88
6.28	1.30
5.03	1.63
3.79	1.78
2.54	1.86
1.28	1.86
0.0	1.79
-1.30	1.68
-2.62	1.52
-3.98	1.29
-5.38	0.89
-6.82	0.50
-8.32	0.24
-9.88	0.10

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
15.09	0.09

300 WATT PAR56 WFL SYMBOL #263 MOUNTING HEIGHT = 28 FEET MOUNTING ANGLE, THETA = 15 DEGREES

13.52	0.20
12.01	0.39
10.55	0.66
9.14	0.93
7.77	1.21
6.43	1.38
5.11	1.53
3.82	1.64
2.54	1.73
1.27	1.81
0.0	1.84
-1.27	1.82
-2.54	1.77
-3.82	1.67
-5.11	1.52
-6.43	1.35
-7.77	1.13
-9.14	0.81
-10.55	0.53
-12.01	0.28
-13.52	0.13
-15.09	0.06

TRANSVERSE "DIAMETER" = 13.52 + 13.52 = 27.03

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.34	0.11
-10.05	0.15
-8.78	0.26
-7.53	0.48
-6.28	0.84
-5.03	1.14
-3.79	1.65
-2.54	1.81
-1.28	1.88
0.0	1.87
1.30	1.74
2.62	1.68
3.98	1.42
5.38	1.16
6.82	0.73
8.32	0.39
9.88	0.17
11.51	0.07

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 28 FEET DISTANCE FROM BASE OF POLE TO CENTER SPOT = 10.19

THETA = 20 DEGREES PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE ILLUMINATION

-8.97	0.14
-7.74	0.19
-6.50	0.27
-5.25	0.76
-3.98	1.32
-2.69	1.68
-1.36	1.74
0.0	1.72
1.41	1.56
2.87	1.38
4.38	1.15
5.97	0.69
7.65	0.31
9.41	0.11
11.29	0.03

RADIAL "DIAMETER" = 9.41 + 7.74 = 17.16

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

12.83	0.11
11.53	0.16
10.25	0.27
8.98	0.48
7.71	0.85
6.45	1.25
5.19	1.55
3.91	1.68
2.63	1.74
1.33	1.73
0.0	1.65
-1.36	1.53
-2.75	1.38
-4.18	1.15
-5.66	0.79
-7.21	0.44
-8.82	0.21
-10.51	0.08

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE ILLUMINATION

15.51 0.08

MOUNTING HEIGHT = 28 FEET

MOUNTING ANGLE, THETA = 20 DEGREES

300 WATT PAR56 CFL SYMBOL 1250

13.89	0.18
12.34	0.36
10.85	0.61
9.39	0.85
7.98	1.12
6.61	1.27
5.25	1.41
3.92	1.51
2.61	1.59
1.30	1.66
0.0	1.70
-1.30	1.67
-2.61	1.63
-3.92	1.54
-5.25	1.40
-6.61	1.25
-7.98	1.04
-9.39	0.74
-10.85	0.49
-12.34	0.26
-13.89	0.12

TRANSVERSE "DIAMETER" = 13.89 + 12.34 = 26.24

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-11.53	0.11
-10.25	0.15
-8.98	0.26
-7.71	0.47
-6.45	0.90
-5.19	1.09
-3.91	1.55
-2.63	1.69
-1.33	1.75
0.0	1.73
1.36	1.59
2.75	1.52
4.18	1.28
5.66	1.03
7.21	0.64
8.82	0.34
10.51	0.15
12.29	0.06

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 28 FEET

THETA = 25 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 13.06

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE ILLUMINATION

-9.37	0.13
-8.12	0.18
-6.85	0.26
-5.55	0.71
-4.23	1.23
-2.87	1.55
-1.46	1.58
0.0	1.54
1.52	1.38
3.11	1.20
4.78	0.99
6.55	0.58
8.43	0.26
10.44	0.09

RADIAL "DIAMETER" = 8.43 + 8.12 = 16.55

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

13.17	0.10
11.87	0.15
10.58	0.26
9.29	0.45
8.00	0.80
6.71	1.17
5.41	1.44
4.09	1.55
2.76	1.58
1.39	1.56
0.0	1.48
-1.43	1.36
-2.91	1.21
-4.45	1.01
-6.04	0.68
-7.71	0.38
-9.47	0.18
-11.33	0.07

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE ILLUMINATION

16.08	0.07
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MOUNTING HEIGHT = 28 FEET

MOUNTING ANGLE, THETA = 25 DEGREES

300 WATT PAR56 WFL SYMROL #263

14.41	0.17
12.80	0.32
11.24	0.55
9.74	0.76
8.28	1.00
6.85	1.14
5.45	1.27
4.07	1.35
2.70	1.43
1.35	1.49
0.0	1.52
-1.35	1.50
-2.70	1.46
-4.07	1.38
-5.45	1.26
-6.85	1.12
-8.28	0.93
-9.74	0.67
-11.24	0.44
-12.80	0.23
-14.41	0.10

TRANSVERSE "DIAMETER" = 14.41 + 12.80 = 27.20

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-10.58	0.14
-9.29	0.24
-8.00	0.44
-6.71	0.75
-5.41	1.01
-4.09	1.43
-2.76	1.55
-1.39	1.58
0.0	1.55
1.43	1.41
2.91	1.34
4.45	1.12
6.04	0.90
7.71	0.55
9.47	0.29
11.33	0.12
13.30	0.05

100 WATT PAR56 WFL SYMROL #263

HEIGHT = 28 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 16.17

THETA = 30 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.96	0.13
-8.66	0.17
-7.34	0.24
-5.97	0.66
-4.57	1.12
-3.11	1.39
-1.59	1.40
0.0	1.34
1.67	1.19
3.44	1.02
5.32	0.82
7.33	0.48
9.49	0.21
11.33	0.07

RADIAL "DIAMETER" = 9.49 + 8.66 = 18.15

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.38	0.14
11.06	0.24
9.74	0.42
8.41	0.73
7.07	1.06
5.71	1.30
4.33	1.38
2.93	1.40
1.48	1.37
0.0	1.29
-1.53	1.18
-3.13	1.04
-4.79	0.86
-6.53	0.57
-8.36	0.32
-10.31	0.15
-12.37	0.06

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.83	0.06

300 WATT PAR56 WFL SYMBOL #263 MOUNTING HEIGHT = 28 FEET MOUNTING ANGLE, THETA = 30 DEGREES

15.08	0.14
13.39	0.28
11.77	0.48
10.19	0.67
8.66	0.87
7.17	1.00
5.70	1.11
4.26	1.18
2.83	1.24
1.41	1.30
0.0	1.33
-1.41	1.31
-2.83	1.27
-4.26	1.20
-5.70	1.10
-7.17	0.98
-8.66	0.81
-10.19	0.58
-11.77	0.38
-13.39	0.20
-15.08	0.09

TRANSVERSE "DIAMETER" = 15.08 + 13.39 = 28.47

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.06	0.13
-9.74	0.23
-8.41	0.40
-7.07	0.68
-5.71	0.91
-4.33	1.28
-2.93	1.37
-1.48	1.39
0.0	1.35
1.53	1.22
3.13	1.15
4.79	0.95
6.53	0.75
8.36	0.46
10.31	0.23
12.37	0.10

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 28 FEET DISTANCE FROM BASE OF POLE TO CENTER SPOT = 19.61

THETA = 35 DEGREES PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.41	0.16
-8.01	0.22
-6.55	0.59
-5.03	0.99
-3.44	1.21
-1.77	1.21
0.0	1.14
1.88	0.99
3.89	0.83
6.05	0.66
9.39	0.38
10.95	0.16
13.76	0.05

RADIAL "DIAMETER" = 10.95 + 8.01 = 18.96

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
13.08	0.13
11.72	0.22
10.34	0.37
8.96	0.65
7.55	0.93
6.12	1.13
4.65	1.20
3.15	1.21
1.60	1.17
0.0	1.09
-1.66	0.99
-3.40	0.87
-5.23	0.71
-7.15	0.47
-9.19	0.26
-11.37	0.12

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
15.94	0.12

MOUNTING HEIGHT = 28 FEET

MOUNTING ANGLE, THETA = 35 DEGREES

300 WATT PAR56 WFL SYMROL #263

14.16	0.24
12.44	0.40
10.78	0.56
9.16	0.74
7.58	0.84
6.03	0.94
4.50	1.00
2.99	1.05
1.49	1.10
0.0	1.12
-1.49	1.11
-2.99	1.08
-4.50	1.02
-6.03	0.93
-7.58	0.83
-9.16	0.69
-10.78	0.49
-12.44	0.32
-14.16	0.17
-15.94	0.08

TRANSVERSE "DIAMETER" = 14.16 + 14.16 = 28.32

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-11.72	0.12
-10.34	0.20
-8.96	0.36
-7.55	0.60
-6.12	0.79
-4.65	1.11
-3.15	1.18
-1.60	1.19
0.0	1.14
1.66	1.03
3.40	0.96
5.23	0.78
7.15	0.61
9.19	0.37
11.37	0.19
13.71	0.04

100 WATT PAR56 WFL SYMBOL #263

HEIGHT = 32 FEET
 THETA = 0 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 0.0
 PER CENT REQ = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-8.57	0.13
-7.09	0.20
-5.64	0.58
-4.21	1.06
-2.80	1.41
-1.40	1.53
0.0	1.58
1.40	1.51
2.80	1.40
4.21	1.23
5.64	0.78
7.09	0.37
8.57	0.14
10.09	0.04

RADIAL "DIAMETER" = 8.57 + 7.09 = 15.67

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
13.25	0.11
11.65	0.19
10.09	0.35
8.57	0.64
7.09	0.98
5.64	1.26
4.21	1.41
2.80	1.50
1.40	1.54
0.0	1.52
-1.40	1.46
-2.80	1.36
-4.21	1.18
-5.64	0.83
-7.09	0.49
-8.57	0.24
-10.09	0.10

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.66	0.08

MOUNTING HEIGHT = 32 FEET

MOUNTING ANGLE, THETA = 0 DEGREES

300 WATT PAR56 WFL SYMBOL #263

14.92	0.17
13.25	0.33
11.65	0.56
10.09	0.79
8.57	1.03
7.09	1.18
5.64	1.30
4.21	1.39
2.80	1.47
1.40	1.53
0.0	1.56
-1.40	1.54
-2.80	1.50
-4.21	1.42
-5.64	1.29
-7.09	1.15
-8.57	0.96
-10.09	0.68
-11.65	0.45
-13.25	0.24
-14.92	0.11

TRANSVERSE "DIAMETER" = 14.92 + 13.25 = 28.18

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.65	0.10
-10.09	0.19
-8.57	0.36
-7.09	0.63
-5.64	0.88
-4.21	1.30
-2.80	1.47
-1.40	1.56
0.0	1.59
1.40	1.51
2.80	1.50
4.21	1.30
5.64	1.09
7.09	0.70
8.57	0.38
10.09	0.17
11.65	0.07

100 WATT PAP56 WFL SYMBOL #263

HEIGHT = 32 FEET
 THETA = 5 DEGREES
 BOTTOM TO TOP - VERTICAL AXIS
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 2.80
 PER CENT RED = 0.150

DISTANCE ILLUMINATION

-8.44	0.14
-7.01	0.21
-5.60	0.60
-4.20	1.09
-2.80	1.43
-1.40	1.51
0.0	1.57
1.41	1.48
2.84	1.36
4.29	1.18
5.77	0.73
7.29	0.34
8.85	0.13
10.46	0.03

RADIAL "DIAMETER" = 8.85 + 7.01 = 15.86

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

13.00	0.12
11.45	0.20
9.95	0.37
8.48	0.67
7.04	1.01
5.61	1.29
4.20	1.43
2.80	1.51
1.40	1.54
0.0	1.50
-1.41	1.43
-2.83	1.32
-4.27	1.14
-5.74	0.80
-7.23	0.46
-8.77	0.22
-10.35	0.09

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE ILLUMINATION

16.72	0.07
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300 WATT PARS6 WFL SYMBOL #263 MOUNTING HEIGHT = 32 FEET MOUNTING ANGLE, THETA = 5 DEGREES

14.98	0.17
13.31	0.33
11.69	0.56
10.13	0.78
8.61	1.02
7.12	1.16
5.66	1.29
4.23	1.38
2.81	1.45
1.40	1.52
0.0	1.55
-1.40	1.52
-2.81	1.44
-4.23	1.40
-5.66	1.28
-7.12	1.14
-8.61	0.95
-10.13	0.68
-11.69	0.44
-13.31	0.24
-14.98	0.11

TRANSVERSE "DIAMETER" = 14.98 + 13.31 = 28.28

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.46	0.11
-9.95	0.20
-8.49	0.37
-7.04	0.65
-5.61	0.90
-4.20	1.32
-2.80	1.47
-1.40	1.56
0.0	1.57
1.41	1.49
2.83	1.43
4.27	1.26
5.74	1.05
7.23	0.67
8.77	0.36
10.35	0.16
11.94	0.06

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 32 FEET

THETA = 10 DEGREES

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 5.64

PER CENT RED = 0.150

DISTANCE ILLUMINATION

-8.44	0.14
-7.04	0.21
-5.64	0.61
-4.25	1.09
-2.84	1.41
-1.43	1.50
0.0	1.51
1.45	1.41
2.93	1.28
4.45	1.10
6.00	0.68
7.61	0.31
9.28	0.12
11.02	0.03

RADIAL "DIAMETER" = 9.28 + 7.04 = 16.32

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

12.90	0.12
11.40	0.21
9.94	0.38
8.49	0.68
7.06	1.02
5.65	1.28
4.24	1.41
2.83	1.48
1.42	1.50
0.0	1.45
-1.44	1.37
-2.90	1.25
-4.38	1.07
-5.90	0.74
-7.46	0.43
-9.07	0.21
-10.74	0.08

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE ILLUMINATION

16.92	0.07
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300 WATT PAR56 WFL SYMBOL #263 MOUNTING HEIGHT = 32 FEET MOUNTING ANGLE, THETA = 10 DEGREES

15.15	0.16
13.46	0.32
11.83	0.54
10.25	0.75
8.71	0.98
7.20	1.12
5.73	1.24
4.28	1.33
2.84	1.40
1.42	1.46
0.0	1.49
-1.42	1.47
-2.84	1.43
-4.28	1.36
-5.73	1.24
-7.20	1.10
-8.71	0.91
-10.25	0.65
-11.83	0.43
-13.46	0.23
-15.15	0.10

TRANSVERSE "DIAMETER" = 15.15 + 13.46 = 28.61

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-11.40	0.11
-9.94	0.20
-8.49	0.37
-7.06	0.65
-5.65	0.90
-4.24	1.31
-2.83	1.45
-1.42	1.52
0.0	1.52
1.44	1.42
2.90	1.39
4.38	1.19
5.90	0.98
7.46	0.62
9.07	0.33
10.74	0.15
12.48	0.06

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 32 FEET

THETA = 15 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 8.57

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-8.57	0.15
-7.18	0.21
-5.77	0.60
-4.36	1.06
-2.93	1.36
-1.48	1.43
0.0	1.43
1.52	1.32
3.07	1.18
4.68	1.00
6.35	0.61
8.08	0.28
9.90	0.10

RADIAL "DIAMETER" = 8.08 + 7.18 = 15.26

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
12.96	0.12
11.49	0.21
10.04	0.38
8.60	0.67
7.17	1.00
5.75	1.25
4.33	1.37
2.90	1.42
1.46	1.42
0.0	1.37
-1.48	1.28
-3.00	1.16
-4.55	0.99
-6.14	0.68
-7.79	0.39
-9.50	0.18
-11.29	0.07

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.25	0.07

MOUNTING HEIGHT = 32 FEET MOUNTING ANGLE, THETA = 15 DEGREES

300 WATT PAR56 WFL SYMROL #263

15.45	0.15
13.72	0.30
12.06	0.51
10.45	0.71
8.88	0.93
7.34	1.06
5.84	1.17
4.36	1.25
2.90	1.32
1.45	1.38
0.0	1.41
-1.45	1.39
-2.90	1.35
-4.36	1.28
-5.84	1.17
-7.34	1.06
-8.88	0.93
-10.45	0.71
-12.06	0.51
-13.72	0.30
-15.45	0.15

TRANSVERSE "DIAMETER" = 15.45 + 13.72 = 29.17

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-11.49	0.11
-10.04	0.20
-8.60	0.37
-7.17	0.64
-5.75	0.88
-4.33	1.26
-2.90	1.39
-1.46	1.44
0.0	1.44
1.48	1.33
3.00	1.20
4.55	1.09
6.14	0.89
7.79	0.56
9.50	0.20
11.29	0.13
13.16	0.05

300 WATT PAR56 WFL SYMBOL #263

WEIGHT = 32 FEET

THETA = 20 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 11.65

PER CENT RFD = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-8.85	0.14
-7.43	0.21
-5.00	0.58
-4.55	1.01
-3.07	1.29
-1.56	1.33
0.0	1.31
1.61	1.20
3.27	1.06
5.01	0.88
6.83	0.53
8.74	0.24
10.76	0.09

RADIAL "DIAMETER" = 8.74 + 7.43 = 16.17

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
13.18	0.12
11.71	0.21
10.26	0.37
8.82	0.65
7.37	0.96
5.93	1.19
4.47	1.29
3.00	1.33
1.52	1.32
0.0	1.26
-1.55	1.17
-3.14	1.05
-4.78	0.88
-6.47	0.60
-8.24	0.34
-10.08	0.16
-12.01	0.06

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.73	0.06

MOUNTING HEIGHT = 32 FEET MOUNTING ANGLE, THETA = 20 DEGREES

300 WATT PAP56 WFL SYMBOL #263

15.88	0.14
14.11	0.27
12.39	0.47
10.74	0.65
9.12	0.86
7.55	0.97
6.00	1.08
4.48	1.15
2.98	1.22
1.49	1.27
0.0	1.30
-1.49	1.28
-2.98	1.25
-4.48	1.18
-6.00	1.07
-7.55	0.95
-9.12	0.79
-10.74	0.57
-12.39	0.37
-14.11	0.20
-15.88	0.09

TRANSVERSE "DIAMETER" = 15.88 + 14.11 = 29.98

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-11.71	0.11
-10.26	0.20
-8.82	0.36
-7.37	0.61
-5.93	0.83
-4.47	1.19
-3.00	1.30
-1.52	1.34
0.0	1.32
1.55	1.22
3.14	1.17
4.78	0.98
6.47	0.79
8.24	0.49
10.08	0.26
12.01	0.11

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 32 FEET

THETA = 25 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 14.92

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.28	0.14
-7.83	0.20
-6.35	0.55
-4.83	0.95
-3.27	1.19
-1.67	1.21
0.0	1.18
1.74	1.06
3.55	0.92
5.46	0.76
7.48	0.45
9.63	0.20
11.93	0.07

RADIAL "DIAMETER" = 9.63 + 7.83 = 17.46

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
13.57	0.12
12.09	0.20
10.62	0.35
9.15	0.61
7.67	0.89
6.18	1.10
4.68	1.18
3.15	1.21
1.59	1.20
0.0	1.13
-1.64	1.04
-3.33	0.93
-5.08	0.77
-6.91	0.52
-8.81	0.29
-10.82	0.14
-12.94	0.05

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.46	0.13

300 WATT PAR56 WFL SYMBOL #263 MOUNTING HEIGHT = 32 FEET MOUNTING ANGLE, THETA = 25 DEGREES

14.63	0.25
12.85	0.42
11.13	0.59
9.46	0.77
7.83	0.87
6.23	0.97
4.65	1.04
3.09	1.09
1.54	1.14
0.0	1.16
-1.54	1.15
-3.09	1.12
-4.65	1.06
-6.23	0.96
-7.83	0.86
-9.46	0.71
-11.13	0.51
-12.85	0.33
-14.63	0.18
-16.46	0.08

TRANSVERSE "DIAMETER" = 14.63 + 14.63 = 29.25

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-12.09	0.11
-10.62	0.19
-9.15	0.34
-7.67	0.57
-6.18	0.77
-4.68	1.09
-3.15	1.18
-1.59	1.21
0.0	1.19
1.64	1.08
3.33	1.03
5.08	0.86
6.91	0.69
8.81	0.42
10.82	0.22
12.94	0.09

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 32 FEET

THETA = 30 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 18.48

PER CENT REQ = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.90	0.13
-8.39	0.18
-6.83	0.50
-5.22	0.86
-3.55	1.06
-1.82	1.07
0.0	1.03
1.91	0.91
3.93	0.78
6.08	0.63
8.38	0.37
10.85	0.16
13.52	0.05

RADIAL "DIAMETER" = 10.85 + 8.39 = 19.23

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.15	0.11
12.64	0.18
11.13	0.32
9.61	0.56
8.08	0.81
6.53	0.99
4.95	1.06
3.35	1.08
1.70	1.05
0.0	0.89
-1.75	0.90
-3.57	0.80
-5.47	0.66
-7.46	0.44
-9.56	0.24
-11.78	0.11

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.23	0.11

MOUNTING HEIGHT = 32 FEET

MOUNTING ANGLE, THETA = 30 DEGREES

300 WATT PAR56 WFL SYMROL #263

15.31	0.21
13.45	0.37
11.65	0.51
9.90	0.67
8.19	0.76
6.52	0.85
4.86	0.90
3.23	0.95
1.61	1.00
0.0	1.02
-1.61	1.00
-3.23	0.98
-4.86	0.92
-6.52	0.84
-8.19	0.75
-9.90	0.62
-11.65	0.44
-13.45	0.29
-15.31	0.16
-17.23	0.07

TRANSVERSE "DIAMETER" = 15.31 + 15.31 = 30.61

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-12.64	0.10
-11.13	0.17
-9.61	0.31
-8.08	0.52
-6.53	0.70
-4.95	0.98
-3.35	1.05
-1.70	1.07
0.0	1.03
1.75	0.94
3.57	0.88
5.47	0.73
7.46	0.58
9.56	0.35
11.78	0.18
14.14	0.08

300 WATT PAR56 WFL SYMROL #263

HEIGHT = 36 FEET
 THETA = 0 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 0.0
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.65	0.10
-7.98	0.16
-6.35	0.46
-4.74	0.84
-3.15	1.12
-1.57	1.21
0.0	1.25
1.57	1.20
3.15	1.11
4.74	0.97
6.35	0.61
7.98	0.29
9.65	0.11
11.35	0.03

RADIAL "DIAMETER" = 9.65 + 7.98 = 17.63

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.91	0.09
13.10	0.15
11.35	0.28
9.65	0.51
7.98	0.77
6.35	0.99
4.74	1.11
3.15	1.19
1.57	1.22
0.0	1.20
-1.57	1.15
-3.15	1.07
-4.74	0.93
-6.35	0.66
-7.98	0.38
-9.65	0.19
-11.35	0.08

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.79	0.13

300 WATT PARSA WFL SYMBOL #263

MOUNTING HEIGHT = 36 FEET

MOUNTING ANGLE, THETA = 0 DEGREES

14.91	0.26
13.10	0.45
11.35	0.62
9.65	0.81
7.98	0.93
6.35	1.03
4.74	1.10
3.15	1.16
1.57	1.21
0.0	1.24
-1.57	1.22
-3.15	1.19
-4.74	1.12
-6.35	1.02
-7.98	0.91
-9.65	0.76
-11.35	0.54
-13.10	0.35
-14.91	0.19
-16.79	0.09

TRANSVERSE "DIAMETER" = 14.91 + 14.91 = 29.82

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-13.10	0.08
-11.35	0.15
-9.65	0.28
-7.98	0.50
-6.35	0.70
-4.74	1.03
-3.15	1.16
-1.57	1.23
0.0	1.26
1.57	1.20
3.15	1.19
4.74	1.03
6.35	0.86
7.98	0.56
9.65	0.30
11.35	0.14
13.10	0.05

100 WATT PAR56 WFL SYMBOL #263

HEIGHT = 34 FEET

THETA = 5 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 3.15

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.50	0.11
-7.89	0.16
-6.30	0.47
-4.72	0.86
-3.15	1.13
-1.58	1.21
0.0	1.24
1.59	1.17
3.20	1.07
4.83	0.93
6.50	0.58
8.20	0.27
9.95	0.10

RADIAL "DIAMETER" = 8.20 + 7.89 = 16.09

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.62	0.09
12.89	0.16
11.20	0.29
9.54	0.53
7.92	0.80
6.32	1.02
4.73	1.13
3.15	1.19
1.58	1.21
0.0	1.19
-1.59	1.13
-3.18	1.04
-4.81	0.90
-6.45	0.63
-8.14	0.36
-9.86	0.19
-11.64	0.07

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
16.05	0.13

MOUNTING HEIGHT = 36 FEET MOUNTING ANGLE, THETA = 5 DEGREES

100 WATT PAR56 WFL SYMBOL #263

14.97	0.26
13.15	0.44
11.29	0.61
9.68	0.81
8.01	0.92
6.37	1.02
4.76	1.09
3.16	1.14
1.58	1.20
0.0	1.22
-1.58	1.20
-3.16	1.17
-4.76	1.11
-6.37	1.01
-8.01	0.90
-9.68	0.75
-11.29	0.54
-13.15	0.35
-14.97	0.19
-16.85	0.09

TRANSVERSE "DIAMETER" = 14.97 + 14.97 = 29.94

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-12.89	0.09
-11.20	0.16
-9.54	0.29
-7.92	0.51
-6.32	0.71
-4.73	1.04
-3.15	1.16
-1.58	1.23
0.0	1.24
1.59	1.17
3.18	1.15
4.81	0.99
6.45	0.83
8.14	0.53
9.86	0.28
11.64	0.13
13.48	0.06

300 WATT PAR56 WFL SYMROL #263

HEIGHT = 36 FEET
 THETA = 10 DEGREES
 DISTANCE FROM BASE OF POLE TO CENTER SPOT = 6.35
 PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.50	0.11
-7.92	0.17
-6.35	0.48
-4.78	0.86
-3.20	1.12
-1.61	1.18
0.0	1.19
1.63	1.12
3.30	1.01
5.00	0.87
6.76	0.53
8.56	0.25
10.44	0.09

RADIAL "DIAMETER" = 8.56 + 7.92 = 16.48

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.51	0.09
12.83	0.17
11.18	0.30
9.55	0.54
7.95	0.80
6.36	1.01
4.77	1.12
3.19	1.17
1.60	1.18
0.0	1.15
-1.62	1.08
-3.26	0.99
-4.93	0.85
-6.64	0.59
-8.40	0.34
-10.21	0.16
-12.09	0.07

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.05	0.13

MOUNTING HEIGHT = 36 FEET MOUNTING ANGLE, THETA = 10 DEGREES

300 WATT PAR56 WFL SYMROL #263

15.14	0.25
13.31	0.43
11.53	0.59
9.79	0.78
8.10	0.89
6.45	0.98
4.81	1.05
3.20	1.11
1.60	1.16
0.0	1.18
-1.60	1.16
-3.20	1.13
-4.81	1.07
-6.45	0.98
-8.10	0.87
-9.79	0.72
-11.53	0.52
-13.31	0.34
-15.14	0.18
-17.05	0.08

TRANSVERSE "DIAMETER" = 15.14 + 15.14 = 30.28

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-12.83	0.09
-11.18	0.16
-9.55	0.30
-7.95	0.52
-6.36	0.71
-4.77	1.03
-3.19	1.14
-1.60	1.20
0.0	1.20
1.62	1.12
3.26	1.10
4.93	0.94
6.64	0.77
8.40	0.49
10.21	0.26
12.09	0.12

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 35 FEET DISTANCE FROM BASE OF POLE TO CENTER SPOT = 9.65

THETA = 15 DEGREES PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.65	0.12
-8.07	0.17
-6.50	0.47
-4.91	0.84
-3.30	1.08
-1.67	1.13
0.0	1.13
1.70	1.04
3.46	0.93
5.27	0.79
7.14	0.48
9.09	0.22
11.14	0.08

RADIAL "DIAMETER" = 9.09 + 8.07 = 17.17

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.58	0.10
12.92	0.17
11.29	0.30
9.68	0.53
8.07	0.79
6.47	0.99
4.87	1.08
3.26	1.12
1.64	1.13
0.0	1.08
-1.67	1.01
-3.37	0.92
-5.17	0.78
-6.91	0.54
-8.77	0.30
-10.69	0.15
-12.70	0.06

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.38	0.12

MOUNTING HEIGHT = 36 FEET MOUNTING ANGLE, THETA = 15 DEGREES

300 WATT PAR56 WFL SYM80L #263

15.44	0.24
13.57	0.40
11.75	0.56
9.99	0.73
8.26	0.84
6.57	0.93
4.91	0.99
3.26	1.04
1.63	1.09
0.0	1.11
-1.63	1.10
-3.26	1.07
-4.91	1.01
-6.57	0.92
-8.26	0.82
-9.99	0.68
-11.75	0.49
-13.57	0.32
-15.44	0.17
-17.38	0.08

TRANSVERSE "DIAMETER" = 15.44 + 15.44 = 30.88

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-12.92	0.09
-11.29	0.16
-9.68	0.29
-8.07	0.51
-6.47	0.69
-4.87	1.00
-3.26	1.10
-1.64	1.14
0.0	1.13
1.67	1.05
3.37	1.02
5.12	0.86
6.91	0.70
8.77	0.44
10.69	0.23
12.70	0.10

100 WATT PAR56 WFL SYMBOL #263

HEIGHT = 36 FEET DISTANCE FROM BASE OF POLE TO CENTER SPOT = 13.10

THETA = 20 DEGREES PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-9.95	0.11
-8.36	0.16
-6.76	0.46
-5.12	0.80
-3.46	1.02
-1.75	1.05
0.0	1.04
1.81	0.95
3.68	0.83
5.64	0.70
7.68	0.42
9.83	0.19
12.10	0.07

RADIAL "DIAMETER" = 9.83 + 8.36 = 18.19

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.82	0.10
13.18	0.16
11.54	0.29
9.92	0.51
8.29	0.76
6.67	0.94
5.03	1.02
3.38	1.05
1.71	1.04
0.0	1.00
-1.74	0.93
-3.53	0.83
-5.37	0.70
-7.28	0.48
-9.26	0.27
-11.34	0.13

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
17.86	0.11

MOUNTING HEIGHT = 36 FEET

MOUNTING ANGLE, THETA = 20 DEGREES

300 WATT PAR56 WFL SYMBOL #263

15.87	0.22
13.94	0.37
12.08	0.52
10.27	0.68
8.49	0.77
6.76	0.85
5.04	0.91
3.35	0.96
1.67	1.01
0.0	1.03
-1.67	1.01
-3.35	0.98
-5.04	0.93
-6.76	0.85
-8.49	0.75
-10.27	0.63
-12.08	0.45
-13.94	0.29
-15.87	0.16
-17.86	0.07

TRANSVERSE "DIAMETER" = 15.87 + 15.87 = 31.74

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-13.18	0.09
-11.54	0.16
-9.92	0.29
-8.29	0.49
-6.67	0.66
-5.03	0.94
-3.38	1.03
-1.71	1.06
0.0	1.04
1.74	0.96
3.53	0.92
5.37	0.77
7.28	0.63
9.26	0.39
11.34	0.20
13.51	0.09

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 40 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 0.0

THETA = 0 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.72	0.08
-8.87	0.13
-7.05	0.37
-5.27	0.68
-3.50	0.90
-1.75	0.98
0.0	1.01
1.75	0.97
3.50	0.90
5.27	0.79
7.05	0.50
8.87	0.24
10.72	0.09

RADIAL "DIAMETER" = 8.87 + 8.87 = 17.74

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.56	0.12
12.61	0.22
10.72	0.41
8.87	0.63
7.05	0.81
5.27	0.90
3.50	0.96
1.75	0.99
0.0	0.97
-1.75	0.93
-3.50	0.87
-5.27	0.75
-7.05	0.53
-8.87	0.31
-10.72	0.15
-12.61	0.06

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
18.65	0.11

MOUNTING HEIGHT = 40 FEET

MOUNTING ANGLE, THETA = 0 DEGREES

300 WATT PAR56 WFL SYMBOL #263

16.57	0.21
14.56	0.36
12.61	0.50
10.72	0.66
8.87	0.75
7.05	0.83
5.27	0.89
3.50	0.94
1.75	0.98
0.00	1.00
-1.75	0.99
-3.50	0.96
-5.27	0.91
-7.05	0.83
-8.87	0.74
-10.72	0.61
-12.61	0.44
-14.56	0.29
-16.57	0.15
-18.65	0.07

TRANSVERSE "DIAMETER" = 16.57 + 16.57 = 33.14

BOTTOM LEFT TO TOP RIGHT - 40 DEGREE AXIS

DISTANCE ILLUMINATION

-12.61	0.12
-10.72	0.23
-8.87	0.40
-7.05	0.57
-5.27	0.83
-3.50	0.94
-1.75	1.00
0.00	1.02
1.75	0.97
3.50	0.96
5.27	0.93
7.05	0.70
8.87	0.45
10.72	0.24
12.61	0.11

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 40 FEET

THETA = 5 DEGREES

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 3.50

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.55	0.04
-8.77	0.13
-7.00	0.38
-5.25	0.70
-3.50	0.91
-1.75	0.98
0.0	1.00
1.77	0.95
3.55	0.87
5.37	0.75
7.22	0.47
9.11	0.22
11.06	0.08

RADIAL "DIAMETER" = 9.11 + 8.77 = 17.88

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.32	0.13
12.44	0.24
10.60	0.43
8.80	0.65
7.02	0.82
5.25	0.91
3.50	0.97
1.75	0.98
0.0	0.96
-1.76	0.92
-3.54	0.84
-5.34	0.73
-7.17	0.51
-9.04	0.29
-10.96	0.14
-12.94	0.06

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
18.72	0.11

MOUNTING HEIGHT = 40 FEET

MOUNTING ANGLE, THETA = 5 DEGREES

300 WATT PAR56 WFL SYMBOL #263

16.63	0.21
14.61	0.36
12.66	0.50
10.76	0.65
8.90	0.74
7.08	0.82
5.29	0.98
3.51	0.93
1.75	0.97
0.0	0.99
-1.75	0.98
-3.51	0.95
-5.29	0.90
-7.08	0.82
-8.90	0.73
-10.76	0.61
-12.66	0.43
-14.61	0.28
-16.63	0.15
-18.72	0.07

TRANSVERSE "DIAMETER" = 16.63 + 16.63 = 33.26

ADDITION LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE ILLUMINATION

-12.44	0.13
-10.60	0.24
-8.80	0.42
-7.02	0.58
-5.25	0.84
-3.50	0.94
-1.75	1.00
0.0	1.01
1.76	0.95
3.54	0.93
5.34	0.80
7.17	0.67
9.04	0.43
10.96	0.23
12.94	0.10

300 WATT PAR56 WFL SYMBOL #263

HEIGHT = 40 FEET

DISTANCE FROM BASE OF POLE TO CENTER SPOT = 7.05

THETA = 10 DEGREES

PER CENT RED = 0.150

BOTTOM TO TOP - VERTICAL AXIS

DISTANCE	ILLUMINATION
-10.55	0.09
-8.80	0.13
-7.05	0.39
-5.31	0.70
-3.55	0.90
-1.79	0.96
0.0	0.97
1.81	0.90
3.66	0.82
5.56	0.70
7.51	0.43
9.52	0.20
11.60	0.07

RADIAL "DIAMETER" = 9.52 + 8.80 = 18.31

BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
14.25	0.13
12.42	0.24
10.61	0.43
8.83	0.65
7.06	0.82
5.30	0.90
3.54	0.95
1.78	0.96
0.0	0.93
-1.80	0.83
-3.62	0.80
-5.48	0.69
-7.38	0.48
-9.33	0.27
-11.34	0.13
-13.43	0.05

RIGHT TO LEFT - HORIZONTAL AXIS

DISTANCE	ILLUMINATION
18.94	0.10

MOUNTING HEIGHT = 40 FEET MOUNTING ANGLE, THETA = 10 DEGREES

300 WATT PAR56 WFL SYMBOL #263

16.82	0.20
14.78	0.34
12.91	0.48
10.88	0.63
9.00	0.72
7.16	0.80
5.35	0.85
3.55	0.90
1.77	0.94
0.0	0.96
-1.77	0.94
-3.55	0.92
-5.35	0.87
-7.16	0.79
-9.00	0.70
-10.88	0.59
-12.81	0.42
-14.78	0.27
-16.82	0.15
-18.94	0.07

TRANSVERSE "DIAMETER" = 16.82 + 16.82 = 33.65

BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS

DISTANCE	ILLUMINATION
-12.42	0.13
-10.61	0.24
-8.83	0.42
-7.06	0.58
-5.30	0.84
-3.54	0.93
-1.78	0.97
0.0	0.97
1.80	0.91
3.62	0.89
5.48	0.76
7.38	0.63
9.33	0.40
11.34	0.21
13.43	0.09

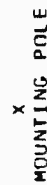
Appendix B

Computer Program

(A Listing of the Template Method Computer Program)

[illegible]

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THE PROGRAM REQUIRES KNOWN COSINE AND TANGENT VALUES FROM 0 TO 90 DEGREES. IT IS CURRENTLY SET UP TO READ IN THESE VALUES IN INCREMENTS OF 2.5 DEGREES, THIS ACCOUNTING FOR THE INDEX OF 37 IN THE FIRST READ STATEMENT. THE ACCOUNTING ANGLE INCREMENT AND CANDLEPOWER DISTRIBUTION

DOS FORTRAN IV 360N-FD-479 3-5 MAINPGM DATE 09/10/71 TIME 11.07.50

C INPUT ANGLES INCREMENT MAY THEREFORE
C BE ANY MULTIPLE OF 2.5 (E.G., 2.5, 5.0).

C DATA CARDS

C THE FIRST SET OF CARDS MUST BE THE KNOWN COS AND TAN VALUES AS
C DESCRIBED ABOVE WITH THE ANGLE, COS, THEN TAN IN 3F10.7 FORMAT.
C THE NEXT CARD SHOULD HAVE THE SINGLE VALUE, TABLE ANGLE INCREMENT,
C IN DEGREES.

C

C IMPLICIT INTEGER*2 (I,N)

C DIMENSION: VPHI(40), FCHI(40), CPV(40), CPH(40), HEADER(10),
A FCRRRT(40), FCHRT(40), FCWTRB(40), FCRTTB(40), CPBRT(40),
B CPTRB(40), COSKWN(37), TANKWN(37), TOP2BT(40), FCRH(40),
C FCMH(40), BR2TL(40), RT2LFT(40), TR2BL(40),
D FCMV(40), FCRV(40), TRRPHI(40), BRTPHI(40)

C TYPE SPECIFICATIONS

C INTEGER*4 VNUM, HNUM, NOBLQ1, NOBLQ2, NEXT, J, M, N, QKSCAN
C INTEGER*2 AREA, AXFSND, HMAX, HMIN, I, IH, II, INCHT,
I JNDX3, JNDX4, JNDX1B, JNDX2B, JNDX1H, JNDX2H,
* JNDX1T, JNDX2T, JNDX1V, JNDX2V, JNDX1S, JNDX2S, K,
2 JNDX1I, JNDX2I, JNDX1R, JNDX2R, JNDX1D, JNDX2D
C INTEGER*2 IPAGE, IPAG1, LINE, LINEN

C LOGICAL*1 BYPASS, HTWRTN, NA2YA4, OPT1, OPT2, OPT3, RDSET1, RDSET2
C COMMON X0, SORT2, D, PCTRE0, PI, DEGRAD, H, M, N, OPT1, NA2YA4

C CONSTANTS

C L = 6
C PI = 3.14159
C PIVR4 = PI / 4.0
C DEGRAD = PI / 180.0
C SQR2 = SQRT (2.0)

C COSINES AND TANGENTS ARE READ IN TO PROVIDE TABLE LOOKUP IN THE INTEREST
C OF SPEED AND EFFICIENCY.

C OFGNC -- INCREMENT FOR ANGLE VARIATION IN COS AND TAN TABLES.

C READ (1,140) (COSKWN (I), TANKWN (I), I = 1, 37), OFGNC

C I READ (1,155) AXFSND, ROLVL1, ROLVL2, INCHT, M, N, QKSCAN
C IPAGE = 1
C IPAG1 = 1

C AXFSND -- INTEGER INDICATING NUMBER OF AXFS FOR WHICH CANDLE POWER
C DISTRIBUTIONS WILL BE INPUT.

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C      AXESNO) = 4 INDICATES 4 AXES CP DIST. INPUT
C      AXESNU) = 2 INDICATES 2 AXES CP DIST. INPUT
C      AXESNO) = 0 INDICATES NO SOURCE, JOB TERMINATION
C
0017  IF (AXESNO.EQ.0) CALL EXIT
0018  IF (AXESNO.EQ.2) NA2YA4 = .FALSE.
0019  IF (AXESNO.EQ.4) NA2YA4 = .TRUE.
C
C      NA2YA4 -- LOGICAL VARIABLE INDICATING 2 OR 4 AXIS METHOD,
C      DEPENDING ON THE INPUT (AXESNO).
C
0020  IF (NA2YA4 ) GO TO 7
C
C      RDLVL1 -- MINIMUM ILLUMINATION LEVEL ACCEPTABLE (RED LIGHT), IN
C      FOOT CANDLES.
C
C      RDLVL2 -- SECOND ILLUMINATION LEVEL OF INTEREST, IF ANY, IN
C      FOOT CANDLES. ZERO, IF NONE SPECIFIED.
C
C      INCHT -- MOUNTING HEIGHT INCREMENT
C
C      * -- UNIT ON WHICH TO OUTPUT COMPLETE LIST OF DISTANCES AND
C      ILLUMINATIONS IF OPT1 AND/OR OPT2 ARE IN EFFECT. NORMALLY,
C      A TAPE UNIT.
C
C      N -- UNIT ON WHICH TO OUTPUT DATA SETS WHICH SATISFY SELECTION
C      CRITERIA. WILL NORMALLY BE THE PRINTER.
C
C      QKSCAN -- UNIT ON WHICH TO OUTPUT LIST OF ACCEPTABLE CONFIGURATIONS
C      IN THE QUICKSCAN FORMAT, SUITABLE FOR RAPID SCANNING AND EASY
C      COMPARING.
C
0021  READ(1,145) VNUM, HNUM, HMIN, HMAX, PCTRED, OPT1, OPT2, OPT3,
A      (HEADER(1), I=1,10)
GO TO 6
C
0022  7 READ (1,150) VNUM, HNUM, NOBLQ1, NOBLQ2, HMIN, HMAX, PCTRED, OPT1,
A      OPT2, OPT3, (HEADER(1), I=1,10)
C
C      VNUM EQUALS NUMBER OF VERTICAL PHI READINGS, AND THE
C      NUMBER OF CANDLEPOWER INPUT READINGS ON THE VERTICAL AXIS
C
C      HNUM EQUALS NUMBER OF HORIZONTAL PHI READINGS, AND THE
C      NUMBER OF CANDLEPOWER INPUT READINGS ON THE HORIZONTAL AXIS
C
C      NOBLQ1 -- NUMBER OF CANDLEPOWER INPUT READINGS ON THE 45 DEGREE AXIS,
C      TOP RIGHT TO BOTTOM LEFT
C
C      NOBLQ2 -- NUMBER OF CANDLEPOWER INPUT READINGS ON THE 45 DEGREE AXIS,
C      BOTTOM RIGHT TO TOP LEFT
C
C      HMIN EQUALS MINIMUM MOUNTING HEIGHT
C      HMAX EQUALS MAXIMUM MOUNTING HEIGHT
C

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C      PCTRED EQUALS PFP CENT RED TRANSMISSION
C
C      OPT1 -- OPTION TO PRINT OUT ON UNIT M A COMPLETE LIST OF DISTANCES
C      AND ILLUMINATION FOR EACH AXIS, FOR EACH DATA SET .NOT. BYPASSED,
C      I.E., EACH DATA SET MEETING THE SELECTION CRITERIA
C
C      OPT2 -- OPTION TO PRINT OUT ON UNIT M A LIST OF THE DISTANCES AND
C      ILLUMINATION ALONG THE VERTICAL AND/OR HORIZONTAL AXES OF
C      A DATA SET THAT HAS BEEN RYPASSED FOR NOT MEETING THE SELECTION
C      CRITERIA
C
C      OPT3 -- OPTION TO PRINT OUT CRITICAL VALUES IN A FORMAT SUITABLE
C      FOR RAPID SCANNING.
C
C      HEADER - LAMP IDENTIFICATION, UP TO 40 CHARACTERS
C
C      PHI -- ANGLE FROM THE CENTER AXIS OF THE LAMP.
C      CP -- CANDLE POWER
C      FCM -- FOOT CANDLES WHITE
C      FCR -- FOOT CANDLES RFD
C
C      SUFFIXES, PREFIXES
C      V - VERTICAL
C      H - HORIZONTAL
C      TRR - TOP RIGHT TO BOTTOM LEFT
C      BRT - BOTTOM RIGHT TO TOP LEFT
C
C      TOP2BT - DISTANCE FROM THE CENTER SPOT ALONG THE VERTICAL AXIS
C
C      RT2LFT - DISTANCE FROM THE CENTER SPOT ALONG THE HORIZONTAL AXIS
C
C      TR2BL - DISTANCE FROM THE CENTER SPOT ALONG THE 45 DEGREE AXIS,
C      TOP RIGHT TO BOTTOM LEFT
C
C      BR2TL - DISTANCE FROM THE CENTER SPOT ALONG THE 45 DEGREE AXIS,
C      BOTTOM RIGHT TO TOP LEFT
C
C      ROSET1 = .TRUE.
C      ROSET2 = .TRUE.
C
C      ROSET1 - LOGICAL VARIABLE INDICATING FOR THE 4-AXIS METHOD WHETHER
C      THE CANDLEPOWER INPUT READINGS ON THE 45 DEGREE AXIS, TOP RIGHT
C      TO BOTTOM LEFT, REMAIN TO BE READ IN.
C
C      ROSET2 - SAME AS ROSET1, BUT FOR THE BOTTOM RIGHT TO TOP LEFT AXIS
C
C      INTO = (VNUM + 1) / 2
C      INTO -- POINTER TO CENTER SPOT ALONG THE VERTICAL AXIS.
C
C      IF ( NA2YA4 ) GO TO 12
C
C      WRITE MESSAGE STATING 2 AXIS METHOD

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0024
0025

0026

0027

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0028 C      WRITE (N,190) IPAGE
0029      WRITE (N,298)
0030      WRITE (N,300)

0031 C      WRITE (L,190) IPAGE
0032      WRITE (L,298)
0033      WRITE (L,300)

0034 C      GO TO 13

0035 C      OUTPUT GUIDE GRAPH SHOWING MOUNTING POLE, DECK, AND
0036 C      SIGN CONVENTIONS FOR 4-AXIS METHOD
0037 C

0038 C      12 WRITE (N,335) IPAGE
0039      WRITE (N,294)
0040      WRITE (N,296)

0041 C      13 WRITE (N,230) ( HEADER(I), I= 1,10)
0042      DO 2 I = 1, VNUM
0043      2 READ (1,160) VPHI(I), CPV(I)

0044 C      IF (VPHI(INT01) .EQ. 0.0 I GO TO 3
0045      WRITE (N,170)
0046      IF ( NA2YA4 ) GO TO 14
0047      NOBLQ1 = 0
0048      NOBLQ2 = 0
0049      14 NEXT = HNUM + NOBLQ1 + NOBLQ2
0050      CALL CLEAR( NEXT, 0 )
0051      GO TO 1

0052 C      THE VERTICAL PHI READINGS SHOULD BE ARRANGED IN DESCENDING ORDER
0053 C      POSITIVE TO NEGATIVE
0054 C      THUS THE MIDDLE READING SHOULD BE 0 DEGREES. IF NOT, SKIP
0055 C      THIS SOURCE AND READ ANOTHER.

0056 C      3 DO 4 I = 1, HNUM
0057      4 READ (1,160) HPHI(I), CPH(I)

0058 C      IF ( NA2YA4 ) GO TO 1009
0059      WRITE (L,235) HEADER
0060      WRITE (L,220) PCTRED
0061      1009 IF ( .NOT. OPT3 ) GO TO 1200

0062 C      WRITE OUT QUICKSCAN TITLING AND HEADINGS

0063 C      IF ( NA2YA4 ) GO TO 2020
0064      WRITE (2KSCAN,190) IPAGE
0065      GO TO 2030

0066 C      2020 WRITE (2KSCAN,335) IPAGE
0067      2030 WRITE (2KSCAN,305) (HEADER(I), I= 1,10), PCTRED
0068      WRITE (2KSCAN,306)
0069      WRITE (2KSCAN,317)

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0062      C      L(NE) = 23
0063      C      IF (RDLVL2.EQ. 0.0) GO TO 1011
0064      C      WRITE (QKSCAN,325) (RDLVL1, RDLVL2, RDLVL1, I = 1, 4 )
0065      C      GO TO 1200
0066      C
0067      C      1011 WRITE (QKSCAN,315) (RDLVL1, I = 1, 8 )
0068      C      1200 DO 40 IH = HMIN, HMAX, INCHT
0069      C      H = IH
0070      C      H EQUALS HEIGHT
0071      C
0072      C      FOR EACH MOUNTING HEIGHT, THE MOUNTING ANGLE OF THE LAMP IS VARIED
0073      C      FROM 0 DEGREES TO 45 DEGREES, IN STEPS OF 5 DEGREES. AFTER 45 DEG,
0074      C      INCREMENT THE HEIGHT AND BEGIN AGAIN WITH 0 DEGREES.
0075      C
0076      C      HTWRN = .FALSE.
0077      C      DO 30 K = 5, 50, 5
0078      C      BYPASS = .FALSE.
0079      C      J = K - 5
0080      C      INDX4 = FLOAT ( J ) / DEGINC + 1.
0081      C      D = H / COSKWN (INDX4 )
0082      C
0083      C      X0 = H * TANKWN (INDX4)
0084      C      XC -- DISTANCE FROM BASE OF 'MOUNTING POLE' TO CENTER SPOT.
0085      C
0086      C      VERTICAL
0087      C
0088      C
0089      C
0090      C
0091      C
0092      C
0093      C
0094      C
0095      C
0096      C
0097      C
0098      C
0099      C
0100      C
0101      C
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0880      C
0881      C
0882      C
0883      C
0884      C
0885      C
0886      C
0887      C
0888      C
0889      C
0890      C
0891      C
0892      C
0893      C
0894      C
0895      C
0896      C
0897      C
0898      C
0899      C
0900      C
0901      C
0902      C
0903      C
0904      C
0905      C
0906      C
0907      C
0908      C
0909      C
0910      C
0911      C
0912      C
0913      C
0914      C
0915      C
0916      C
0917      C
0918      C
0919      C
0920      C
0921      C
0922      C
0923      C
0924      C
0925      C
0926      C
0927      C
0928      C
0929      C
0930      C
0931      C
0932      C
0933      C
0934      C
0935      C
0936      C
0937      C
0938      C
0939      C
0940      C
0941      C
0942      C
0943      C
0944      C
0945      C
0946      C
0947      C
0948      C
0949      C
0950      C
0951      C
0952      C
0953      C
0954      C
0955      C
0956      C
0957      C
0958      C
0959      C
0960      C
0961      C
0962      C
0963      C
0964      C
0965      C
0966      C
0967      C
0968      C
0969      C
0970      C
0971      C
0972      C
0973      C
0974      C
0975      C
0976      C
0977      C
0978      C
0979      C
0980      C
0981      C
0982      C
0983      C
0984      C
0985      C
0986      C
0987      C
0988      C
0989      C
0990      C
0991      C
0992      C
0993      C
0994      C
0995      C
0996      C
0997      C
0998      C
0999      C
1000      C

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0098      IF (.NOT. BYPASS) GO TO 17
0099      C
0100      IF (.NOT. OPT2) GO TO 15
0101      C
0102      WRITE (M,201) (HEADER(I), I=1,10), IH, XO, J, PCTRED
0103      WRITE (M,200)
0104      WRITE (M,100) (VPHI(I), CPV(I), FCRV(I), FCRV(I), TOP2BT(I),
0105      * I = 1, VNUM )
0106      GO TO 15
0107      C
0108      IF (.NOT. OPT1) GO TO 16
0109      WRITE (M,201) (HEADER(I), I=1,10), IH, XO, J, PCTRED
0110      WRITE (M,200)
0111      WRITE (M,100) (VPHI(I), CPV(I), FCRV(I), FCRV(I), TOP2BT(I),
0112      * I = 1, VNUM )
0113      C
0114      16 CALL NDXSET ( VNUM, FCRV, NOXL01, NOXH11, ROLV1 )
0115      C
0116      IF ( RDLVL2 .NE. 0.0 ) CALL NDXSET ( VNUM, FCRV, NOXLV, NOXHV,
0117      1 RDLVL2 )
0118      C
0119      BL = TOP2BT (NOXL01)
0120      BKT = TOP2BT (NOXH11)
0121      BK = ARS (BKT)
0122      ALRK = BL + BK
0123      C
0124      IF ( NAZYA4 ) GO TO 57
0125      C
0126      C.....
0127      C TWO AXIS METHOD, VERTICAL OUTPUT DETERMINATION
0128      C
0129      C.....
0130      C.....
0131      C RADIAM -- RADIAL DIAMETER IN 2-AXIS TECHNIQUE. I.E., THE DISTANCE
0132      C BETWEEN CRITICAL VALUE ILLUMINATION LEVELS 1.2 FC) ALONG THE
0133      C VERTICAL AXIS.
0134      C
0135      C EIVP -- EDGE ILLUMINATION, VERTICAL PLUS EDGE
0136      C FIVM -- EDGE ILLUMINATION, VERTICAL MINUS EDGE
0137      C
0138      C EIVP = FCRV(NOXL01)
0139      C FIVM = FCRV(NOXH11)
0140      C
0141      C RADIAM = IFIX ( BLBK + 0.5 )
0142      C
0143      C.....
0144      C HORIZONTAL
0145      C
0146      C.....
0147      C 57 IF ( OPT1 ) WRITE (M,110)
0148      C

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0109      DO 20 I = 1, HNUM
0110      HORANG = HPHI (I)
0111      (NDX3 = ABS ( HORANG ) / DEGINC + 1.
0112      GG = D / COSKWN(NDX3)
0113      FCRH(I) = H * CPH(I) * 1000. / (GG * GG * GG)
0114      FCRH (I) = FCRH (I) * PCTRED
0115      TANAID = TANKWN (NDX3)
0116      IF ( HORANG .LT. 0.0 ) TANAID = - TANAID
0117      20 RT2LET (I) = D * TANAID
C
C      BYPASS IF ANY ONE OF THE EXTREME OUTERMOST VERTICAL
C      OR HORIZONTAL EDGE ILLUMINATIONS IS GREATER THAN 0.3 FC.
C
0118      IF ((FCRH(1).GT.0.3).OR.(FCRH(HNUM).GT.0.3)) BYPASS = .TRUE.
0119      IF (.NOT. BYPASS ) GO TO 18
0120      IF (.OPT2) WRITE (M,100)(HPHI(I), CPH(I), FCRH(I), FCRH(I),
C      * RT2LET(I), I = 1, HNUM )
C      GO TO 15
0121
0122      18 IF IOPT1) WRITE (M,100)(HPHI(I), CPH(I), FCRH(I), FCRH(I),
C      * RT2LET(I), I = 1, HNUM )
C
0123      CALL NDXSET ( HNUM, FCRH, NDXL02, NDXHI2, RDLVL1 )
0124      IF ( RDLVL2 .NE. 0.0 ) CALL NOXSET ( HNUM, FCRH, NDXLH, NDXHH,
C      1 RDLVL2 )
C
0125      CF1 = RT2LET (NDXL02)
0126      CF2T = RT2LET (NDXHI2)
0127      CF2 = ABS (CF2T)
0128      CF1CF2 = CF1 + CF2
C
0129      IF ( NA2YA4 ) GO TO 58
C.....
C      TWO AXIS METHOD, HORIZONTAL OUTPUT DETERMINATION
C.....
C.....
C      TROIAM -- TRANSVERSE DIAMETER IN 2-AXIS TECHNIQUE. I.E., THE DISTANCE
C      BETWEEN CRITICAL VALUE ILLUMINATION LEVELS 1.2 FC) ALONG THE
C      HORIZONTAL AXIS.
C
0130      E1HP -- EDGE ILLUMINATION, HORIZONTAL PLUS EDGE
0131      E1HM -- EDGE ILLUMINATION, HORIZONTAL MINUS EDGE
C
0132      TROIAM = IFIX 1 CF1CF2 + 0.5 )
0133      E1HP = FCRH (NDXL02)
0134      E1HM = FCRH (NDXHI2)
0135      AREA = PIOVR4 * RADIAM * TROIAM
C
0136      IF ( HTWRN ) GO TO 19
0137      WRITE (L,240) (H
0138      HTWRN = .TRUE.
C

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```

0137 19 WRITE (L,210) J, XO, RADIAM, TRDIAM, AREA, REDCTR, EIVP, EIVM,
0138 1 FTHP, FTHM, RL, BK, CF1, CF2
0139 GO TO 605
C
C 58 IF ( OPT1 ) WRITE (M,130)
C
C .....
C
C ORLJOUF AXES
C
C .....
C
C CALL ORLIQ ( NOBLQ1, TRBPHI, CPTRB, FCWTRB, FCRTRB, IR2BL, -1.,
C < R0SET1 )
C
C CALL NDXSET ( NOBLQ1, FCRTRB, NDXLO4, NDXHI4, ROLVLI )
0142 IF ( ROLVL2 -NE. 0.0 ) CALL NDXSET ( NOBLQ1, FCRTRB, NDXLT, NDXHT,
C 1 ROLVL2 )
C
C IF ( OPT1 ) WRITE (M,135)
C
C CALL ORLIQ ( NOBLQ2, BRTPHI, CPBRT, FCWBRT, FCRBRT, BR2TL, 1.,
C , R0SET2 )
C
C CALL NDXSET ( NOBLQ2, FCRBRT, NDXLO3, NDXHI3, ROLVLI )
0146 IF ( ROLVL2 -NE. 0.0 ) CALL NDXSET ( NOBLQ2, FCRBRT, NDXLB, NDXHR,
C 1 ROLVL2 )
C
C
C
C OUTPUT SECTION FOR ABRIDGED ILLUMINATION PROFILE
C
C 605 IPAGE = IPAGE + 1
C WRITE (N, 201) HEADER, IPAGE, IH, XO, J, PCTRED
C
C WRITE (N,260)
C LINEN = 15
C CALL RESET (INDX1V, INDX2V, NDXLO1, NDXHI1, VNUM)
C ISUM = INDX1V + INDX2V
C
C DO 610 I = INDX1V, INDX2V
C
C PRINT MINUS TO PLUS
C
C
C 1) = ISUM - I
C WRITE (N,180) TOP2BT(IH), FCRV(IH)
C LINEN = LINEN + 1
C IF ( LINEN .LE. 56 ) GO TO 610
C IPAGE = IPAGE + 1
C WRITE (N,205) HEADER, IH, J, IPAGE
C LINEN = 2
C 610 CONTINUE
C
C WRITE (N,120) CL, BK, BLNK
C

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0163      IF ( .NOT. NA2YA4 ) GO TO 625
0164      WRITE IN,270)
0165      LINEN = LINEN + 7
0166      CALL RESET IINDX18, INDX28, NDXLD3, NDXHI3, NDBLQ2 )
C
0167      DO 620 I = INOX18, INOX28
0168      WRITE IN,180) RT2LT III, FCRRRTIII
0169      LINEN = LINEN + 1
0170      IF ( LINEN .LE. 56 ) GO TO 620
0171      IPAGE = IPAGE + 1
0172      WRITE IN,205) HEADER, IH, J, IPAGE
0173      LINEN = 2
0174      620 CONTINUE
C
0175      WRITE IN,280)
0176      LINEN = LINEN + 7
0177      CALL RESET IINDX1H, INOX2H, NDXLD2, NDXHI2, HNUM)
C
0178      DO 630 I = INOX1H, INOX2H
0179      WRITE IN,180) RT2LTIII, FCRRHIII
0180      LINEN = LINEN + 1
0181      IF ( LINEN .LE. 56 ) GO TO 630
0182      IPAGE = IPAGE + 1
0183      WRITE IN,205) HEADER, IH, J, IPAGE
0184      LINEN = 2
0185      630 CONTINUE
C
0186      WRITE IN,125) CF1, CF2, CF1CF2
0187      IF ( .NOT. NA2YA4 ) GO TO 650
C
0188      WRITE IN,290)
0189      LINEN = LINEN + 7
0190      CALL RESET IINDX1T, INDX2T, NDXLD4, NDXHI4, NDBLQ1 I
0191      ISUM = INOX1T + INOX2T
C
0192      DO 640 I = INOX1T, INDX2T
C
C      PRINT MINUS TO PLUS
C
0193      II = ISUM - I
0194      WRITE IN,180) TR2BLIII, FCRRRTIII
0195      LINEN = LINEN + 1
0196      IF ( LINEN .LE. 56 ) GO TO 640
0197      IPAGE = IPAGE + 1
0198      WRITE IN,205) HEADER, IH, J, IPAGE
0199      LINEN = 2
0200      640 CONTINUE
C
0201      650 IF ( .NOT. DPT3 ) GO TO 30
C
0202      IF ( NA2YA4 ) GO TO 660
C

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DOS	FORTAN IV	360N-10-479 3-5	MAINPGM	DATE	09/10/71	TIME	11.07.50
0203	C		IF (RDLVL2 .EQ. 0.0) GO TO 1031				
0204			WRITE (OKSCAN,340) IH, XO, J, BKT, TOP2BT(NDXHV), TOP2BT(NDXLV),				
0205			A BL, CF2T, RT2LFT(NDXHH), RT2LFT(NDXLH), CF1				
0206			LINE = LINE + 2				
0207			IF (LINE .GT. 54) GO TO 1015				
			GO TO 30				
0208	C		1031 WRITE (OKSCAN,350) IH, XO, J, BKT, BL, CF2T, CF1				
0209			LINE = LINE + 2				
0210			IF (LINE .GT. 54) GO TO 1015				
0211			GO TO 30				
0212	C		660 IF (RDLVL2 .EQ. 0.0) GO TO 1021				
0213			WRITE (OKSCAN,320) IH, XO, J,				
			A BKT, TOP2BT(NDXHV), TOP2BT(NDXLV), BL				
			B BR2TL (NDXH(3)), BR2TL (NOXH8), BR2TL (NDXL8), BR2TL (NDXL03),				
			C CF2T, RT2LFT(NDXHH), RT2LFT(NDXLH), CF1				
			D TR2BL (NDXH(4)), TR2BL (NDXHT), TR2BL (NOXL1), TR2BL (NDXL04)				
0214			LINE = LINE + 2				
0215			IF (LINE .GT. 54) GO TO 1015				
0216			GO TO 30				
0217	C		1021 WRITE (OKSCAN,310) IH, XO, J, BKT				
			A BR2TL(NDXH(3)), BR2TL(NDXL03), CF2T, CF1, BL				
			B TR2BL(NDXH(4)), TR2BL(NDXL04)				
0218			LINE = LINE + 2				
0219			IF (LINE .GT. 54) GO TO 1015				
0220			GO TO 30				
0221	C		1015 IPAG1 = IPAG1 + 1				
0222			WRITE (OKSCAN,335) IPAG1				
0223			LINE = 1				
0224			GO TO 30				
0225	C		15 IF (OPT2) WRITE (M,250)				
0226			30 CONTINUE				
0227			40 CONTINUE				
0228	C		IF (ROSET1 .AND. NA2YA4) CALL CLEAR (NOBLQ1, NOBLQ2)				
	C		ARE THERE OTHER SOURCES?				
	C		GO TO 1				
0229	C		FORMATS				
0230	C		100 FORMAT (F20.1, F19.2, 3F21.2)				
0231			110 FORMAT ('0' / '0' / '9X', 'HOR(ZONTAL' //)				
0232			120 FORMAT ('1', 55X, 'RADIAL "DIAMETER" = ', F6.2, ' +', F6.2,				
			A ' ', F8.2)				
0233			125 FORMAT ('1', 55X, 'TRANSVERSE "DIAMETER" = ', F6.2, ' +', F6.2,				
			A ' ', F8.2)				
0234			130 FORMAT ('0' / '0' / '9X', 'TOP RIGHT TO ' / '10X, 'BOTTOM LEFT')				

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0235 135 FORMAT ( '0','0' / 9X, 'BOTTOM RIGHT' / 10X, 'TO TOP LEFT' )
0236 140 FORMAT ( 10X, 2F10.1 )
0237 145 FORMAT ( 414, F8.3, 3L1, 10A4 )
0238 150 FORMAT ( 614, F8.3, 3L1, 10A4 )
0239 155 FORMAT ( 14, 2F6.1, 414 )
0240 160 FORMAT ( 2F10.1 )
0241 170 FORMAT ( '0 THE VERTICAL PHI READINGS ARE NOT IN PROPER ORDER. '
      A 'READ NEXT SOURCE, IF ANY.' )
      C

0242 180 FORMAT ( 2F20.2 )
0243 190 FORMAT ( 'HORIZONTAL AND VERTICAL AXES INPUT ONLY' T125, 'PAGE '
      A 14 )
0244 200 FORMAT (
      D 15X, 'DISTANCE' / 16X, 'PHI', 15X, 'POWER', 15X,
      E 'CANDLES', 14X, 'CANDLES', 15X, 'FROM' / 38X, '-3', 15X, 'WHITE',
      F 17X, 'RED', 16X, 'CENTER' / 34X, 'X 10' / '0', 9X, 'VERTICAL' / )
      C

0245 201 FORMAT ( '1', / '0' 10A4, T125, 'PAGE ' 14 /
      * '0' 2X, 'HEIGHT = ' 12, 4X, 'FEET',
      A 16X, 'DISTANCE FROM BASE OF POLE TO CENTER SPOT = ' 17.2 / '0'
      B 2X, 'THETA = ' 12, 4X, 'DEGREES', 13X, 'PER CENT RED',
      C 10X, '= ' 12, 4X, 'FEET' / '0' )
0246 205 FORMAT ( '1' 10A4, 8X 'MOUNTING HEIGHT = ' 12, ' FEET' 8X
      A 'MOUNTING ANGLE, THETA = ' 12, ' DEGREES' T125, 'PAGE '
      B 14 / )
      C

0247 210 FORMAT ( '0', 5X, 12, 9X, F6.1, 8X, 13, 11X, 13, 9X, 14, 5X, F6.2,
      L 5X, 4F6.2, 4F7.1 )
      C

0248 220 FORMAT ( '0' 60X 'RED TRANSMISSION FACTOR (Z RED) = ' F6.3 /
      Z '0' 2X 'VERTICAL R-RADIAL T-TRANSVERSE
      A AREA CENTER' 14X 'EDGE' 14X 'SEMI-Axes LENGTH' / 4X
      B 'AIMING DISTANCE (VERTICAL) (HORIZONTAL) (TRT) '
      C 'ILLUMINA--' 10X, 'ILLUMINA--' / '0' 55X '---' /
      D ' DIAMETER 14 ) 5X 'ANGLE TO CENTER DIAMETER'
      E ' TION, RED' 10X 'TION, RED' /
      F 3X, 'DEGREES D FT FT
      G 'FT*FT FC' 18X, 'FC' / '0', 10X, '---' /
      H 80X '1' 5X '2' 5X '3' 5X '4' 6X '5' 6X '6' 6X '7' 6X '8' 6X '9' 6X '0' / '0'
      I 79X '0' 5X '1' 5X '2' 5X '3' 5X '4' 6X '5' 6X '6' 6X '7' 6X '8' 6X '9' / )
      C

0249 230 FORMAT ( '0' 10A4 / '0A8RIDGED ILLUMINATION PROFILE' )
0250 235 FORMAT ( '0' 10A4 )
      C

0251 240 FORMAT ( 9X, 4(
      A '1', 27X, '1' / '0', 45X, 'HEIGHT ' 12, ' FT.' / )
      C

0252 250 FORMAT ( ' THIS DATA SET HAS BEEN RYPPASSED ' )
      C

0253 260 FORMAT ( '0 BOTTOM TO TOP - VERTICAL AXIS' / '0', 12X, 'DISTANCE
      L ILLUMINATION' / '0' )
      C

0254 270 FORMAT ( '0 BOTTOM RIGHT TO TOP LEFT - 45 DEGREE AXIS' / '0',
      L 12X, 'DISTANCE ILLUMINATION' / '0' )

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0255 280 FORMAT (/ 0 RIGHT TO LEFT - HORIZONTAL AXIS / 0 12X,
 1 *DISTANCE ILLUMINATION / 0)
 0256 290 FORMAT (/ 0 BOTTOM LEFT TO TOP RIGHT - 45 DEGREE AXIS / 0 12X,
 1 *DISTANCE ILLUMINATION / 0)

0257 C 294 FORMAT (32X *TOP /
 A 18X *TOP * 9X * 9X * TOP /
 B 18X *LEFT * 8X * 8X * RIGHT /
 C 25X * * * * *
 D 24X * * * * *
 E 27X * * * * *
 F 28X * * * * *
 G 29X * * * * *
 H 30X * * * * *
 I 28X * * * * *
 J 14X *LEFT * 45 * * 45 *
 K * 19X * 12X * 12X * *) RIGHT /

0258 C 296 FORMAT (33X
 A 28X * * * * *
 B 30X * * * * *
 C 29X * * * * *
 D 28X * * * * *
 E 27X * * * * *
 F 24X * * * * *
 G 25X * * * * *
 H 16X *BOTTOM * 9X * 9X * * BOTTOM /
 I 17X *LEFT * 12X * 11X * RIGHT /
 J 30X *BOTTOM / 0 * 0 * 33X * 0 /
 K * 32X * * / 27X *MOUNTING POLE)

0259 C 298 FORMAT (0 32X, 33 / 23X, *
 A * / 16X, * 15X, *
 B * 12X, *MOUNTING / 13X, * 19X, * 8X, * 13X, *POLE /
 C 11X, * 2, 11X, * 0)

0260 C 300 FORMAT (* 12X, * 19X, * 9X, * 13X, * 13X,
 A * * * * *
 B / 15X, * 16X, * 7X, * * / 17X, * 14X, * 4X, *
 C / 22X, * * * * *
 305 FORMAT (73X * TOP * * / LAMP - 54X, 38X *TOP *
 A * * * TOP * 22X * * / 69X *LEFT * * * RIGHT * 21X
 B * * * * *
 C 78X * 31X * * 0 7X * * 54X, 45X * * 29X * 7X * * /
 D * 4X * * RIGHT * 20X * 12X * * 66X *
 E * * * * *
 F * 16X * *)

0262 106 FORMAT (3X * (PER CENT RED) 59X * * 29X * V
 A * * * / 74X * * * * / 67X *BOTTOM * * * BOTTOM * 23X
 B * * * * *
 C *BOTTOM / 0 77X * * / 72X *MOUNTING POLE)
 307 FORMAT (0 16X * 4 * * * * *
 A * 17X, 4 * 24X * 17X * * * * *
 B * 17X, 4 * 24X * 17X * * * * *
 C * 17X, 4 * 24X * 17X * * * * *

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C *TOP LEFT TO BOTTOM RIGHT->|<-----LEFT TO RIGHT----->|<-
D *BOTTOM LEFT TO TOP RIGHT->|<-----LEFT TO RIGHT----->|<-
E 7( ' ' ) / 17X , 4( ' ' ) , 7( ' ' ) / ' ' 13X , 4( 1X ,
F 2( 6X , ' ' ) , 2( 6X , ' ' ) / ' ' 4X ' 0' 5X ' 0' 3X ,
G 4( ' ' ) DIR DIST TO ILLUM LEVEL OF ' ' ) / ' ' 12X ' ' )
310 FORMAT ( ' 0' 12 , F7.1 , 14 , 3X , 4( ' ' ) , 6X , 2F7.1 , 8X )
315 FORMAT ( 17X , 4( ' ' ) , 9X , F3.1 , 4X , F3.1 , 9X ) /
A ' ' , 12( ' ' )
320 FORMAT ( ' 0' 12 , F7.1 , 14 , 3X , 4( ' ' ) , 4( F6.1 , 1X ) )
325 FORMAT ( 17X , 4( ' ' ) , 2X , 3( F3.1 , 4X ) , F3.1 , 2X ) /
A ' ' , 12( ' ' )
335 FORMAT ( ' 1' 1125 , ' PAGE ' 14 )
340 FORMAT ( ' 0' 12 , F7.1 , 14 , 3X , 2( ' ' ) , 4( F6.1 , 1X ) , ' 1' 28X )
350 FORMAT ( ' 0' 12 , F7.1 , 14 , 3X , 2( ' ' ) , 6X , 2F7.1 , 8X ' 1' 28X )
END

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```

0001  SUBROUTINE DPLIQ ( NDBLQ1, TRBPHI, CPTRB, FCWTRB, FCRTIRB, IR2BL,
      *      SIGN, RDSSET I
0002  INTEGER*4 NDBLQ1
0003  INTEGER*2 HAFWAY, HAFAGN, II, I
0004  LOGICAL*1 POSITV, OPT1, RDSSET, NAZYA4
0005  DIMENSION TRBPHI(40), CPTRB(40), FCWTRB(40), FCRTIRB(40), TR2BL(40)
0006  COMMON X0, SQR2, D, PCTRED, PI, DEGRAD, H, M, N, OPT1, NAZYA4
0007  HAFWAY = IFIX( FLOAT(NDBLQ1) / 2. )
0008  POSITV = .TRUE.
0009  COSGAM = SIGN * X0 / (SQR2 * D )
0010  GAMMA = ARCOS I COSGAM I
0011  DSGAM = 0 * SIN ( GAMMA )
0012  DO 390 II = 1, HAFWAY
0013  IF I POSITV ) I = II
0014  IF I .NOT. POSITV I I = HAFAGN + II
0015  IF (RDSSET) READ (1,160) TRBPHI(II), CPTRB(II)
0016  CONVERT DEGREES TO RADIAN
0017  BETA = TRBPHI(II) * DEGRAD
0018  DELTA = PI - (GAMMA + ABS ( BETA ) )
0019  SNDELT = SIN ( DELTA )
0020  GG = DSGAM / SNDELT
0021  FCWTRB II) = H * CPTRB(II) * 1000. / IGG * GG * GG )
0022  FCRTIRB III) = FCWTRB(II) * PCTRED
0023  TR2BL(II) = D * SIN (BETA / SNDELT
0024  IF ( OPT1 I WRITE (M,100) TRBPHI(II), CPTRB(II), FCWTRB(II), FCRTIRB
      A      III, TR2BL(II)
0025  390 CONTINUE
0026  IF I POSITV ) GO TO 300
0027  RDSSET = .FALSE.
0028  RETURN
0029  300 HAFAGN = HAFWAY + I
0030  IF (RDSSET) READ(1,160) TRBPHI(HAFAGN), CPTRB(HAFAGN)
0031  FCWTRB(HAFAGN) = H * CPTRB(HAFAGN) * 1000. / (D*D*DI
0032  FCRTIRB(HAFAGN) = FCWTRB(HAFAGN) * PCTRED
0033  TR2BL (HAFAGN) = 0.0
0034  I = HAFAGN
0035  IF ( OPT1 I WRITE (M,100) TRBPHI(II), CPTRB(II), FCWTRB(II), FCRTIRB
      A      III, TR2BL(II)
0036  POSITV = .FALSE.
0037  COSGAM = - COSGAM
0038  GO TO 200
0039  100 FORMAT (14X, F5.1, 14X, F6.2,
0040  160 FORMAT ( 2H10.1 )
      F4.0
3(15X,F6.2))

```

UDS FORTRAN IV 360N-FD-479 3-5 NOXSET DATE 08/06/71 TIME 08.02.35

```

0001 SUBROUTINE NOXSET ( VNUM, FCR, INDX1, INDX2, RDLVL )
0002 INTEGER*4 VNUM
0003 INTEGER*2 INDX1, INDX2, IJ, JK
0004 LOGICAL*1 NA2YA4, OPT1
0005 COMMON X0, SURT2, U, PCTRED, PI, DEGRAD, H, M, N, OPT1, NA2YA4

C
C SUBROUTINE NOXSET FINDS THE CRITICAL ILLUMINATION VALUES (ROLVL)
C AND SETS POINTERS TO THEM
C
C INDX1 -- POINTER TO POSITIVE VALUE (DIRECTED DISTANCE) LIMIT
C INDX2 -- POINTER TO NEGATIVE VALUE (DIRECTED DISTANCE) LIMIT
C
C
C DIMENSION FCR(40)
C
C TWORED = 2.0 * RDLVL
C
C
C 00 14 IJ=2, VNUM
C IF(FCR(IJ).LT. ROLVL) GO TO 14
C IF (FCR(IJ) +FCR(IJ-1) - TWORED) 16, 16, 17
C INDX1 = IJ
C GO TO 18
C INDX1= IJ-1
C GO TO 18
C CONTINUE
C
C 00 19 IJ=2,VNUM
C JK= VNUM -IJ+1
C IF (FCR(JK).LT. RDLVL) GO TO 14
C IF (FCR(JK)+FCR(JK+1) - TWORED) 21, 21, 22
C INDX2= JK+1
C RETURN
C INDX2=JK
C RETURN
C CONTINUE
C
C
C END

```

```

D05 FORTRAN IV 360N-FU-474 3-5      RESET      DATE 08/06/71      TIME 08.01.59

0001      SUBROUTINE RESET ( INDX1, INDX2, NDX1, NDX2, MNUM )
0002      IMPLICIT INTEGER*2 (I,N)
0003      INTEGER*4 MNUM
0004      C
0005      IF ( NDX1 .EQ. 1 ) GO TO 61
0006      INDX1 = NDX1 - 1
0007      GO TO 62
0008      61 INDX1 = NDX1
0009      C
0010      62 IF ( NDX2 .EQ. MNUM ) GO TO 63
0011      INDX2 = NDX2 + 1
0012      RETURN
0013      63 INDX2 = NDX2
0014      RETURN
0015      END

```

```

D05 FORTRAN IV 360N-FU-474 3-5      CLEAR      DATE 08/06/71      TIME 08.01.43      PAGE 0001

0001      SUBROUTINE CLEAR ( NDBLQ1, NDBLQ2 )
0002      C
0003      INTEGER*4 NDBLQ1, NDBLQ2
0004      INTEGER*2 NDBLQ1, NDBLQ2
0005      LOGICAL*1 NA2YAA, UPT1
0006      COMMON X0, SORT2, D, PCIRCD, PI, DEGPAD, H, M, N, UPT1, NA2YAA
0007      C
0008      NDBLQ1 = NDBLQ1 + NDBLQ2
0009      DO 10 I = 1, NDBLQ1
0010      10 READ (1,160) ANGL, CANPUM
0011      C
0012      WRITE (N,220)
0013      220 FORMAT ( ' NO ACCEPTABLE COMBINATIONS FOUND FOR THIS SOURCE. INPUT
0014      A CLEARED.' )
0015      160 FORMAT ( 2F10.1 )
0016      RETURN
0017      END

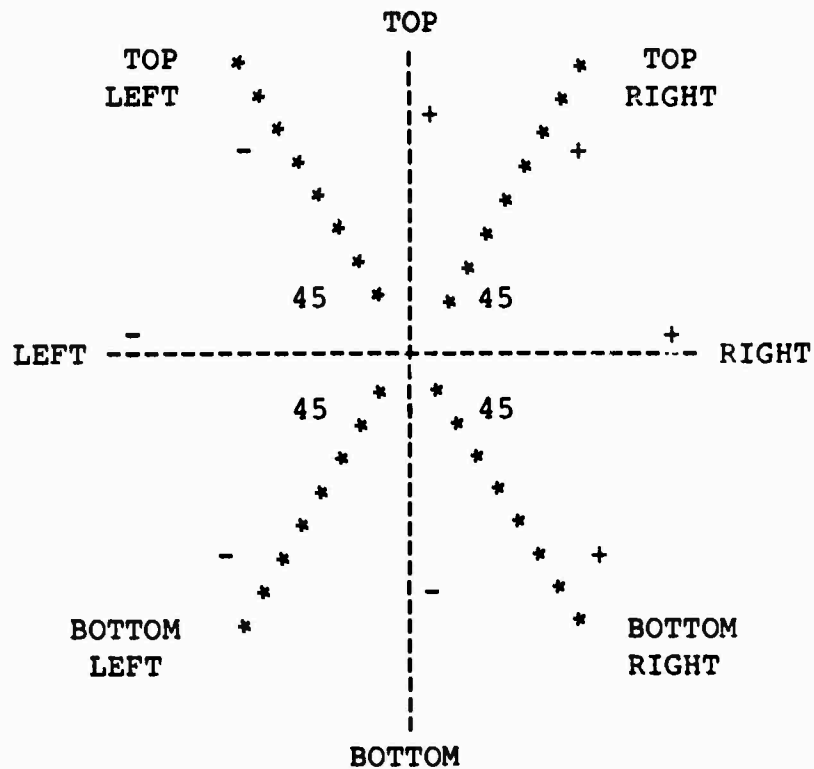
```

Appendix C

User's Guide

(A User's Guide for the Template Method Computer Program)

The template method computer program processes candlepower distributions for two or four axes and computes an illumination profile, a lighting pattern which is characteristic of a given lamp, mount (fixture), mounting height and angle. The axes' candlepower distributions must be structured according to the following format:




 MOUNTING POLE

The axis labels are in accord with the view from behind the lamp and along the center line of the beam. Such readings are not generally available, and have consequently been expressly measured by NAVSHIPRANDCEN Annapolis.

The program requires known cosine and tangent values from 0° to 90°. It is currently set up to read in these values in increments of 2.5°, thus accounting for the index of 37 in the first read statement. This 2.5° increment is consistent with the increment in the candlepower distribution inputs; for the purposes of table lookup of cosines and tangents, it must be read in next as the quantity, DEGINC. Thus, the first data cards to be read contain:

Columns 1-10 ϕ	Columns 11-20 COS ϕ	Columns 21-30 tan ϕ
0.0	1.0000000	0.0
2.5	0.9990482	0.0436609
5.0	0.9961948	0.0874885
7.5	0.9914449	0.1316522
10.0	0.9848078	0.1763267
12.5	0.9762962	0.2216945
15.0	0.9659260	0.2679489
17.5	0.9537172	0.3152984
20.0	0.9396929	0.3633699
22.5	0.9238798	0.4142129
25.0	0.9063081	0.4663069
27.5	0.8870112	0.5205662
30.0	0.8660258	0.5773493
32.5	0.8433918	0.6370692
35.0	0.8191525	0.7002062
37.5	0.7933539	0.7673256
40.0	0.7660451	0.8390981
42.5	0.7372780	0.9163293
45.0	0.7071074	0.9999981
47.5	0.6755909	1.0913057
50.0	0.6427884	1.1917505
52.5	0.6087623	1.3032217
55.0	0.5735774	1.4281445
57.5	0.5373008	1.5696802
60.0	0.5000018	1.7320423
62.5	0.4617503	1.9209728
65.0	0.4226198	2.1444979
67.5	0.3826848	2.4142036
70.0	0.3420222	2.7474566
72.5	0.3007076	3.1715708
75.0	0.2588207	3.7320242
77.5	0.2164420	4.5106554
80.0	0.1736503	5.6712065
82.5	0.1305282	7.5956392
85.0	0.0871584	7.5956392
87.5	0.0436218	11.4296980
90.0	0.0	22.9024658
DEGINC	2.5	99999999.9 (∞)

Each source to be evaluated will be read in one axis at a time, vertical, horizontal, top-right-to-bottom-left, and bottom-right-to-top-left. For a source with only two axes' input available the last two will, of course, to be omitted. Two cards must precede these inputs, however. The first must contain the following:

Column 4	a single digit, the number of axes to be processed, 2 or 4. (AXESNO)
5-10	the minimum illumination acceptable in foot-candles (ft-c), in this case 0.2 ft-c. (RDLVL1)
11-16	a second illumination level of interest, if any. (e.g., 0.5 ft-c). (RDLVL2)
17-20	the desired increment for mounting heights, we have generally used 4 feet. This quantity must be right justified, i.e., in column 20. (INCHT)
24	the unit number indicating which computer I/O device to which you will output the complete illumination distribution, if so desired; usually a tape.
28	the unit number indicating which you will output the "abridged illumination distribution profile".
32	the unit number indicating which computer I/O device to which you will output the "quickscan summary format", if so desired; usually a tape, to be listed after the corresponding "abridged" profile.

The format of the next card depends on whether the source to follow has two- or four-axes inputs.

For the two-axis the card should contain:

- Column 1-4 VNUM, the number of candlepower input readings on the vertical axis, right justified.
- 5-8 HNUM, the number of candlepower input readings on the horizontal axis, right justified.
- 9-12 HMIN, the minimum mounting height to be considered, right justified.
- 13-16 HMAX, the maximum mounting height to be considered, right justified.
- 17-24 PCTRED, percent transmission of red filter used. For the Kopp 6350 filter, PCTRED = 0.15 (15%).
- 25 OPT1, option (valued T or F), to permit printing of a complete list of distances and illuminations for each axis, for each data set not bypassed; i.e., each data set meeting the selection criteria.
- 26 OPT2, option (valued T or F), to permit printing of a complete list of distances and illuminations along the vertical and/or horizontal axes of a data set that has been bypassed for not meeting the selection criteria.
- 27 OPT3, option (valued T or F), to permit printing of critical values in a format suitable for rapid scanning, the "quicksan format".
Note: If OPT3 = F, RDLVL2 should be equal to 0.0.
- 28-47 title identifying the lamp.
- 48-67 title identifying the fixture or mount.

For the four-axis technique, the card should contain:

Column 1-4	VNUM, same as two-axis.
5-8	HNUM, same as two-axis.
9-12	NOBLQ1, the number of candlepower input readings on the oblique (45°) axis, top-right-to-bottom left.
13-16	NOBLQ2, the number of candlepower input readings on the oblique (45°) axis, bottom-right-to-top-left.
17-20	HMIN, same as two-axis.
21-24	HMAX, same as two-axis.
25-32	PCTRED, same as two-axis.
33	OPT1, same as two-axis.
34	OPT2, same as two-axis.
35	OPT3, same as two-axis.
36-55	lamp identification.
56-75	fixture identification.

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13. ABSTRACT

This report describes a simple procedure for designing red lighting systems for use during night shipboard underway replenishment. Use of this method, which employs a federal stock lighting fixture, produces a lighting system layout plan that can be used to verify and check the adequacy of the lighting system. The method is sufficiently general that it can be utilized to design various lighting systems using other types of lighting fixtures.

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